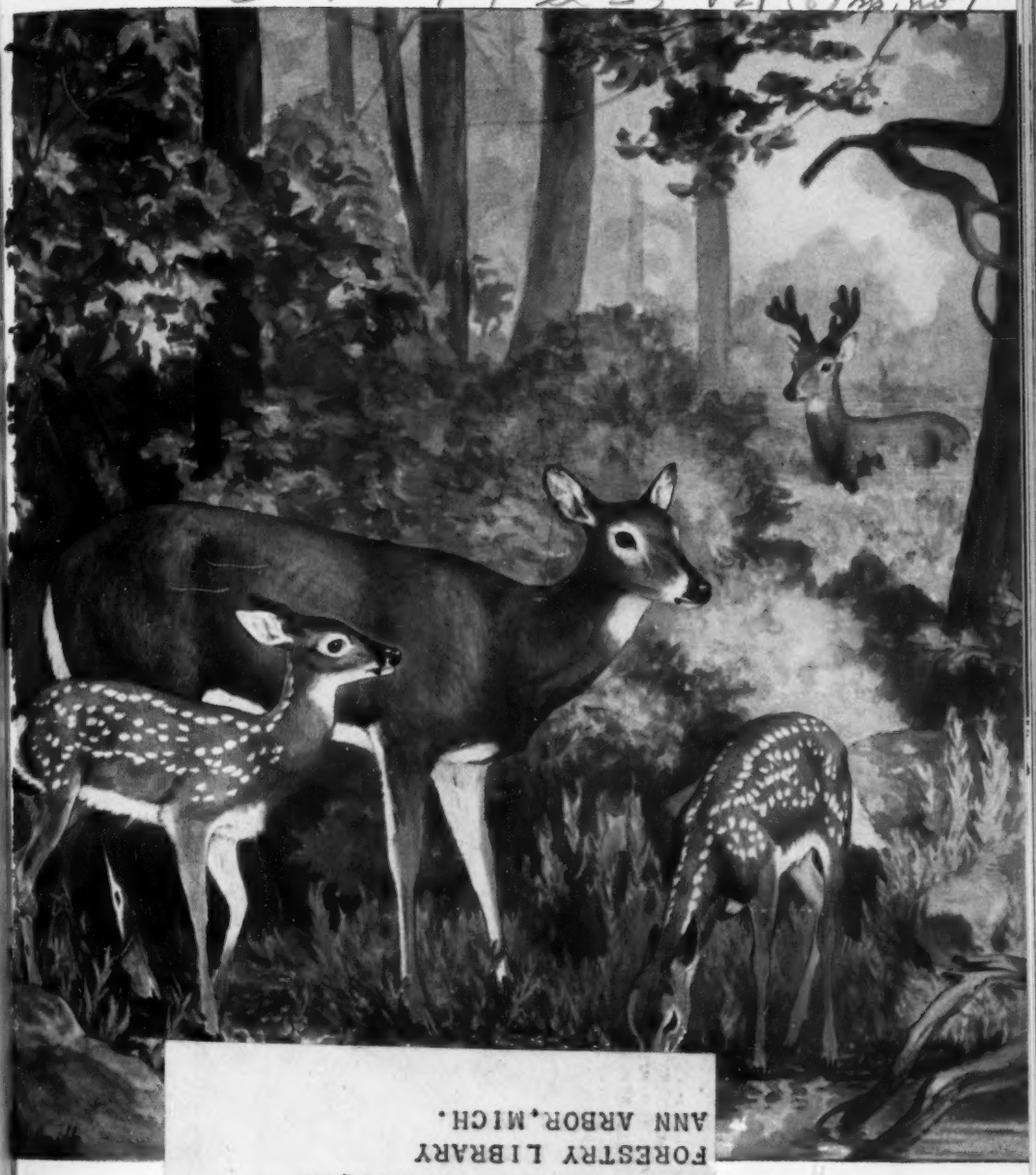
PENNSYLVANIA

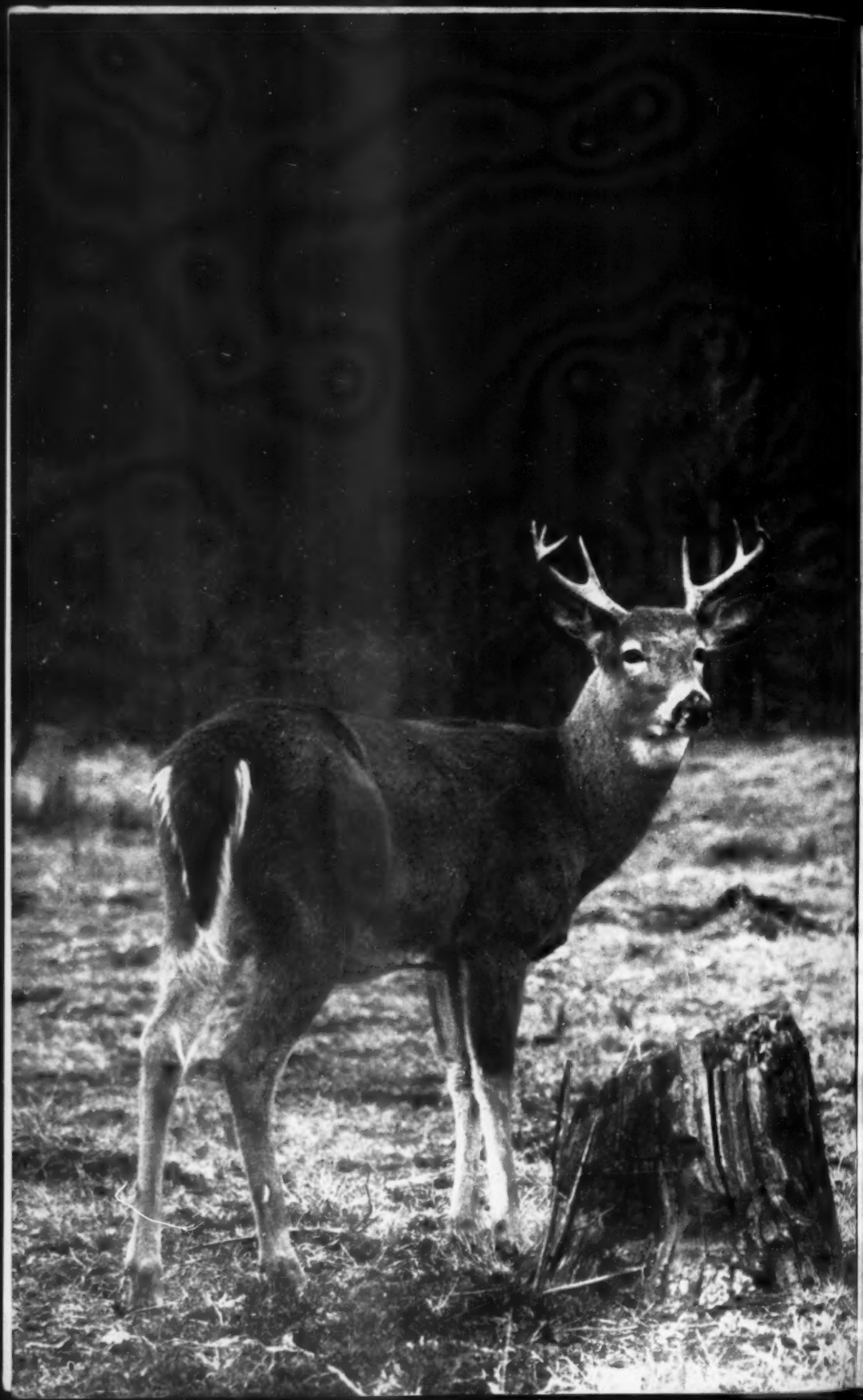
Game News

SD 12 P4 A2 35 V21 (6) Apr, no 1



UNIVERSITY OF MICHIGAN
FORESTRY LIBRARY
ANN ARBOR, MICH.

SEPTEMBER [illegible] AL ISSUE NO. 1



PENNSYLVANIA Game News

Published Monthly
by the
Pennsylvania Game Commission

Commonwealth of Pennsylvania

JAMES H. DUFF, GOVERNOR

★

PENNSYLVANIA GAME COMMISSION

Ross L. Leffler, *President* .....Pittsburgh
Robert Lamberton, *Vice-Pres.* .....Franklin
Col. Nicholas Biddle .....Bethayres
G. I. Phillips .....Alexandria
Harold Moltz .....Williamsport
John C. Herman .....Dauphin
B. K. Williams .....E. Stroudsburg
Joseph P. Willson .....Smethport

Thos. D. Frye
Executive Director

★

PENNSYLVANIA GAME NEWS

Will Johns .....Editor
Ned Smith .....Art
Zelda Ross .....Circulation

SPECIAL ISSUE No. 1

"Our Deer Problem"

CONTENTS

Foreword 2
Introduction 4
Life History 5
History of the Whitetail In Pennsylvania 10
Management Problems and Research Studies 13
Possible Solutions to Management Problems 28
Management Recommendations 33
An Appeal to the Deer Hunters Of Pennsylvania 38
Bibliography 39
Do You Know? Questions and Answers About White-tailed Deer 41

HOW TO SUBSCRIBE

RATES—$1.00 for one year, $1.50 for two years, and $2.00 for three years, with a special rate of 50 cents for all resident sportsmen's organizations when such subscriptions are submitted in lots of ten or more. Remittance by check or money order to be made payable to the Department of Revenue, Commonwealth of Pennsylvania. CASH FORWARDED AT SENDER'S RISK. STAMPS NOT ACCEPTABLE. Your local Game Protector, County Treasurer, or other Hunting License Issuing Agent will take your subscription; or you may forward it direct to the Pennsylvania Game Commission, Harrisburg, Pa.

Please report all changes of address promptly, sending both your old and new addresses. Address all communications to the Editorial Office, Pennsylvania Game Commission, Harrisburg, Pa.

Entered as second-class matter at the Post Office of Harrisburg, Pennsylvania, under the Act of March 3, 1879. Mailed in conformity with P. O. D. Order No. 19687.

Permission to reprint will be granted provided proper credit is given.

Foreword

This special issue of the PENNSYLVANIA GAME NEWS, which is a forerunner of others to follow, is intended as an educational medium to assure greater appreciation of the problems of conservation and our wildlife, as well as the need for wise management.

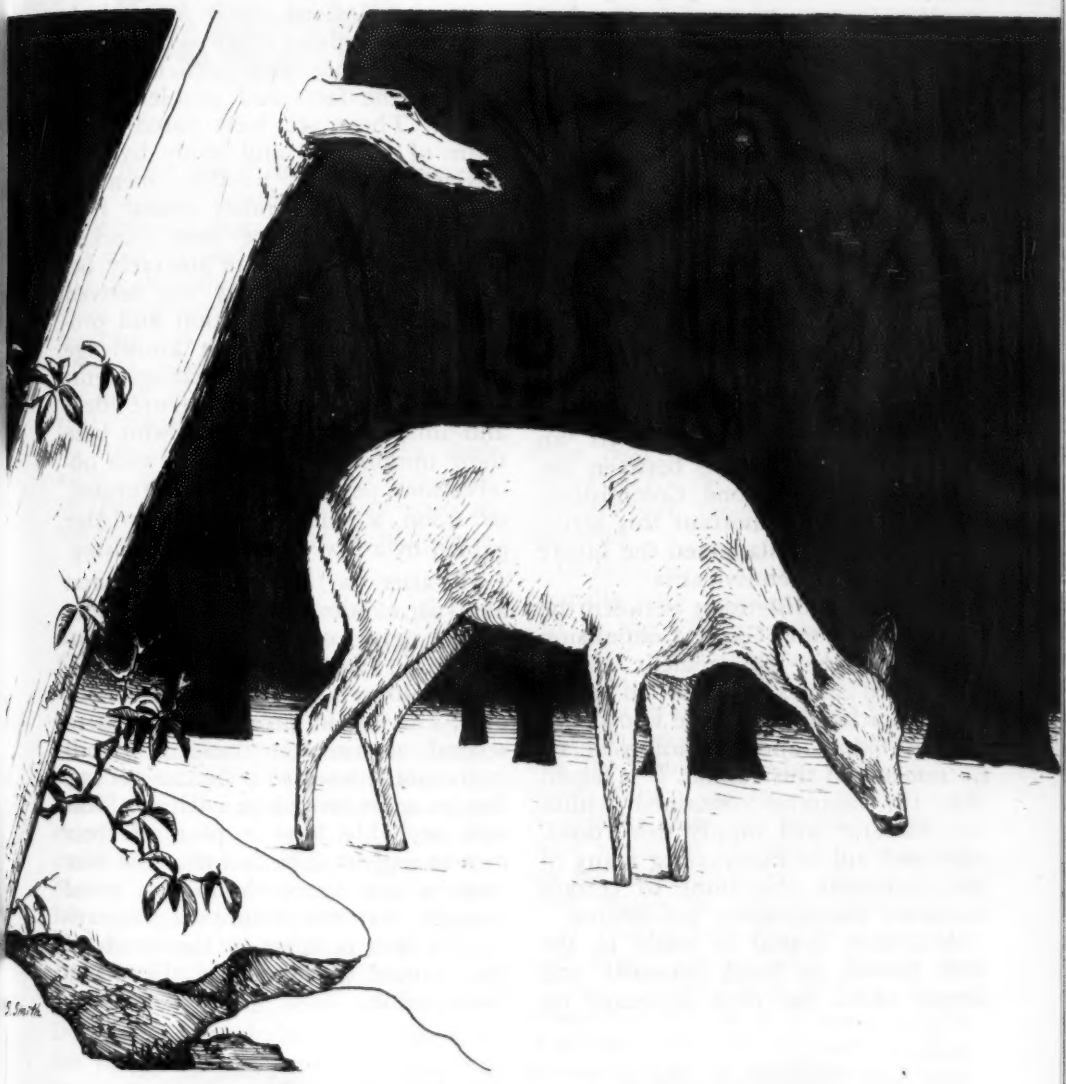
Education is essential to achieve understanding which can easily bring sympathetic response—vital to success. PENNSYLVANIA'S DEER PROBLEM is presented with the confidence that it will provide broad factual information on a difficult and highly controversial wildlife management problem—the solution of which is not likely to be accepted until it is better understood by everyone.

In this issue the well qualified author presents a clear and unbiased account of the recreational value of the Pennsylvania deer herd, as well as its devastating effects if not properly controlled.

With the knowledge that the information is factual and the conviction that it should prove both enlightening and beneficial to the general public, this issue is made available as a conservation education service.

Additional copies in limited numbers can be procured by enclosing ten cents (10c) in coin to cover cost of mailing and handling to: Pennsylvania Game Commission, Harrisburg, Pa.

Pennsylvania's DEER PROBLEM



by ROGER M. LATHAM

INTRODUCTION

THIS bulletin has been written for the deer hunters of Pennsylvania. Its purpose is to present to these hunters a brief and concise account of the problems which face the Game Commission in its attempt to manage the deer herd sensibly and scientifically. *The constant goal of this management is to provide the best possible deer hunting on a sustained basis—that is, maximum production for next year, for ten years later, and for generations to come.*

Probably the most formidable problem which has confronted the Game Commission during the past 30 years, and one which has seriously hampered scientific management, has been the opposition of well-meaning, but uninformed, deer hunters. This lack of confidence in the ability of the Commission and its trained personnel to formulate and carry out sound management practices has created an undesirable relationship between the hunter and the Game Commission, and even more important this active opposition has endangered the future of the sport in Pennsylvania.

Most of the dissension between the hunters and the Game Commission concerning the management of the deer herd arises because so many sportsmen lack a complete knowledge of the habits and physiological requirements of this animal. It is hoped that the material contained within this bulletin will supply this knowledge and aid in eliminating many of the perennial objections to certain necessary management procedures.

A sincere appeal is made to the deer hunter to think seriously and deeply about the facts presented on the following pages. It is suggested that for the moment he forget his own pet ideas about how the deer should be managed, forget about the deer in his own "backyard," forget what Tom Jones said about how the Game Commission is ruining the hunting in Pennsylvania, forget the outmoded notions about deer which have been handed down from father and grandfather, and open his mind wide to the facts and problems presented. These are facts based upon years of research and study by professionally-trained wildlife men in Pennsylvania and other states; they are facts which have been checked and rechecked and are sincerely believed to be true; they are derived from scientific investigation and propounded from the latest knowledge in the field of wildlife management; *they are facts,* not the insecure ideas and imaginings of laymen who base their opinions upon one or two observations, perhaps poorly interpreted, or upon a questionable knowledge gained by a few years of deer hunting.

If after a careful and honest analysis of the contents the reader cannot agree and feels that his solution to the deer problem is preferable, he should try an experiment of his own. He should present his ideas to several of his deer hunting friends individually and see if he can get any two to agree with him entirely. Most will probably have a plan of their own to suggest. The fact that few deer hunters can agree should be proof enough that the future of Pennsylvania's deer is safest in the hands of the trained personnel of the Game Commission.

LIFE HISTORY

A brief life history will be presented merely to acquaint the hunter with certain facts which may aid him in understanding the necessity or desirability of certain management practices outlined later in the bulletin. A surprising number of hunters, who regularly criticize management polices, do not even know that deer are red in summer and gray in winter, or that they shed their antlers and grow a new rack each year, or that a buck may have as many as ten points upon its first set of antlers.

Mating

The rutting season is normally confined to the months of October, November, and December in Pennsylvania. However, in some sections of the state where the sex ratio of adult deer greatly favors the female, some does may not be bred at the usual time. It appears that these does may then enter another oestrous cycle sometime during February or March, and, if bred at that time, the fawns are born in September. A very few may not be bred until June or July, and the fawns resulting from these matings are born in January. During each antlerless deer season a few pregnant does are shot containing embryos which would have been born within a few weeks. September-born fawns weighing as little as eighteen pounds hog-dressed have been killed during these seasons. Although persons who kill these tiny fawns may be criticized and ridiculed by other hunters, their deed is likely an act of mercy, as the chances for these immature deer to survive the winter are slight. It is better that they should be killed quickly and mercifully than be permitted to die a lingering death from cold and malnutrition during mid-winter. Needless to say, no January-born fawns could survive in the wild.

In captivity, a buck may mate successfully with a dozen or more does, but in the wild a ratio greater than three or four does to one buck is likely to lead to the condition mentioned above. If the 30,000 mature bucks killed during the hunting season represent about 40 per cent of those alive during October and November, then this would mean that there would be one buck of breeding age for about every 200 acres of forest land. When so sparsely distributed, it is readily conceivable that some does might not be bred during the regular rutting season. Whitetails are believed to be the most monogamous of all deer and a sex ratio of one male to one female is probably the optimum breeding population.

Does have been known to breed successfully for as long as 12 to 15

Fawns are normally born between late May and early July. Unless separated by accident or death, they will stay with the mother throughout the winter.

years. Since in the wild the average age of deer appears to be less than three years, it is believed that *there is normally no such thing as a barren doe.* Some does may not be bred because of the greatly unbalanced sex ratio or a very few may be incapable of reproduction because of injury, *but it would certainly be a rare occurrence for a doe to become barren simply because she was too old to reproduce.*

During the fall, adult bucks will fight nearly every time they meet. Few animals exhibit the ferocity, strength, and speed of the whitetail, and a buck fight is an awe-inspiring spectacle. With hair standing erect and ears laid back on their swollen necks, they walk stiff-leggedly sideways toward each other, and then, when about ten feet apart, they suddenly lunge forward and crash head-on. They may separate immediately and strike again and again, or they may leave their antlers locked and push with all their might until one is forced backward or down on its knees. Superiority is quickly recognized, and the vanquished is not too proud to turn tail and run. For this reason, few deer are killed when fighting, although occasionally the antlers of two bucks may become so inextricably interlocked that the contestants die from starvation.

Fawning

Except for the two abnormal periods already mentioned, fawns are born between late May and early July—the gestation period being about 210 days. It appears that as many as 20 to 30 per cent of yearling does, which have been reared under good range conditions, will reproduce. At this age, a single fawn is born, but in older deer twins are the rule and triplets are not uncommon. *However, when a range is overcrowded and nutrition is inadequate, single fawns are the rule and twins are the exception.*

Fawns weigh from 4 to 7 pounds at birth and are able to stand within 24 hours. They do not follow the

mother for the first few weeks, but remain where they are placed in the leaves or grass until the doe returns at "feeding times." Within a month, or less, the fawns may begin to nibble at green material and follow the mother for short distances. Although fully weaned by early fall, they will stay with the parent throughout the winter unless separated by accident or death. The reproductive responsibilities of bucks end with fertilization, and they spend the spring and summer in groups of two or three apart from the does and fawns.

The protective natal coat which blends so admirably with sunshine-blotched leaves is retained until late September or early October, when it is replaced by the gray coat of winter. All deer shed semi-annually—to a red summer coat in April and back to the gray winter pelage in September. The red summer hair is shorter, sparser, and of a smaller diameter than the hollow, air-filled gray of winter. These hollow hairs provide efficient insulation against cold and a buoyancy to the animals when swimming.

Food Habits

The food habits of Pennsylvania whitetails have changed greatly within the past 40 years. It is no longer a case of the deer choosing the browse they most prefer, but, instead, being forced to eat anything and everything to survive. *It has been found repeatedly that where deer are abundant certain plant species may be heavily browsed, but on areas where deer are only common to scarce these same species may be almost or entirely untouched. Also, because of over-browsing, some of the most palatable and nutritious species may have been eliminated from parts of the range, and the deer, through the effects of their own voracious appetites, have had to substitute less desirable trees and shrubs in their diet.* When browse was plentiful, the tough fibrous twigs of the oaks, beech, and other similar woody plants were practically untouched, but today these same trees have become important browse species in some regions. Only in recent years has the Hercule's Club been utilized by deer, and now the bark is stripped as high as the deer can reach. This plant is becoming increasingly scarce on the deer range.

To name all of the plant species browsed by deer would mean presenting the reader with an almost complete check list of the native and introduced plants of the state. Bailey (1928) in speaking of the Pennsylvania deer herd said: "From life-long observations on the food habits of deer over practically all of the United States, I am aware of their varied food habits, but never before have I found them in one locality feeding on so many different kinds of vegetation." Almost any plant may be browsed or grazed to a greater or lesser extent sometime during the year, particularly when natural food is scarce. However, there are certain foods which deer will eat in preference to others when these are available.

Clepper (1931) listed 110 woody plant species browsed by Pennsylvania deer. Those which were browsed heavily included several exotics and the following natives: red pine, pitch pine, short-leaf pine, white pine, hemlock, white cedar, yew, sassafras, gooseberry, wild currant, witch hazel, apple, mountain ash, wild black cherry, sumac, red maple, sugar maple, striped maple, wild grape, basswood, Hercule's Club, dogwoods, willows, both aspens, sweet fern, smooth alder, beech, chestnut, white oak, chestnut oak, scarlet oak, scrub oak, American elm, rhododendron, laurel, arbutus, teaberry, huckleberry, blueberry, white ash, honeysuckle, viburnums, and elderberry.

In spite of this impressive list and

The fawn's protective spotted coat is retained until late September or early October when it is replaced by the gray coat of winter.

in spite of the fact that all were browsed heavily, it is known that some plants included within the list are not preferred foods or even nutritionally desirable. Also, other trees and shrubs which are known to be utilized in quantity by deer are not mentioned.

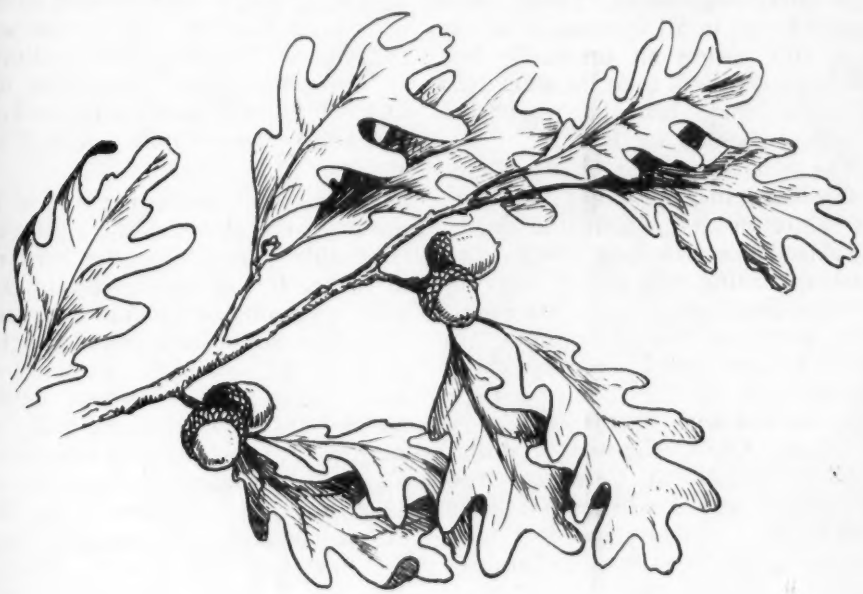
The work of Forbes and Bechdel (1931) showed that both laurel and rhododendron have a minimum value as food for deer, and that animals placed upon this diet alone would lose weight rapidly and die within a short time unless some supplemental food was offered. Most of the native conifers seem to be less nutritious than many of the better hardwood species and serve mostly as "filler" during the shortages of winter.

Mast, such as acorns and beechnuts, add to the fall and winter diet and are especially valuable as a source of protein and fat. A heavy acorn crop often permits the deer to enter the winter with a fair amount of fat stored over the rump and around the kidneys and this aids considerably in survival during the winter months. The loss of the chestnut reduced the total food-producing capacity of the forests and consequently reduced the carrying capacity of the range.

As the browse became badly depleted in the forests because of overbrowsing and the maturation of the timber, the deer were forced to turn to agricultural crops to survive. It is only when natural food as found in the forests is insufficient that deer are driven into the fields, but, when once educated to eat farm crops, deer may alter their normal diet to include these items even if natural foods again become abundant.

Predation

Because of its size, the whitetail deer has few natural enemies in Pennsylvania. Probably stray dogs are most destructive to adult deer, and foxes may lead in the killing of fawns. So few wildcats are left in the state that it is not unlikely that their removal of small, weak, and diseased individuals may have a beneficial effect upon the prosperity of the herd. Because bears are hibernating during the season when deer could be caught and killed by these animals, their predatory activities upon deer are believed to be of little consequence.



HISTORY OF THE WHITETAIL IN PENNSYLVANIA

THERE can be no question but that the vast stretches of virgin forest in Pennsylvania at the time of the first colonization supported far fewer deer than the second-growth forests of today. In fact, the present-day deer hunter probably would be greatly perturbed by a similar number. It is altogether likely that more deer are shot in one day of an antlerless season in Pennsylvania than were killed in five or more years by the early Indians over the same area.

During the late 1800's and early 1900's, the whitetail had been nearly extirpated from the state. It was possible to walk for days through the mountains without sighting a single track in the snow, and when someone was lucky enough to kill a deer it became front-page news. Today, deer can be found in all 67 counties of the state and, unless an unusually fine specimen is killed, even the next-door neighbor may not be interested enough to ask to see it.

The first step taken by the Game Commission in an attempt to restore the whitetail to a reasonable degree of abundance came in 1897 when market hunting, the use of dogs for hunting deer, and killing deer at salt licks were outlawed. Beginning in 1905, refuges were established in various parts of the state and these were stocked with deer bought from Michigan, Ohio, Kentucky, Maine, New Jersey, North Carolina, New Hampshire, and Pennsylvania. From 1906 to 1924 nearly 1,200 deer were released in the mountains, and of these nearly half were bought from dealers in Pennsylvania.

In 1907 the Buck Law was passed which prohibited the taking of antlerless deer. Although the law was originally intended as a measure to make deer hunting safer and to increase the number of breeding females, and was probably a wise management tool at the time, within twenty years it became one of the greatest stumbling blocks in the way of sound deer management. The sportsmen of Pennsylvania fought bitterly against the Buck Law when it was passed, and fought just as bitterly twenty years later when an attempt was made to legalize the killing of antlerless deer. Originally the Buck Law stipulated that any male deer with visible antlers could be shot in season; later the regulations were changed so that the antlers had to be at least two inches long; then four inches long; still later six inches long; and finally two or more points to one antler as it is today.

Range conditions at the turn of the century were ideal for the almost unbelievable growth that the herd was to make. It was nearly certain that, with a reasonable amount of protection, deer would have staged a highly-satisfactory comeback without the Buck Law. This measure merely speeded the inevitable. At this time the forests of the state had been newly cut and the mountains were covered with brush which provided the deer with a maximum of food and cover. The few deer which were living at

that time found browse of the highest quality in unlimited quantity. Under these optimum range conditions, the herd skyrocketed within a few years from a mere handful to nearly a million animals. Within twenty years the Game Commission had the unique experience of being faced with two problems exactly opposite in character —too few deer in 1905 and too many deer in 1925.

This pyramiding of numbers can best be demonstrated by presenting the annual kill figures. Table 1 gives the kill figures from 1915 to the present for antlered bucks and antlerless deer. It was estimated that less than 200 deer were killed over the entire state in 1907, but in 1940 over 186,000 fell before the hunter's guns, and this figure did not include other thousands killed by motorists on the highways, by farmers for crop damage, and by poachers. Annual kill averages based upon five-year periods since 1915 show that there has been a constant, and almost miraculous, increase in numbers with no tendency toward a leveling off until the present five-year period (Figure1).

This tremendous herd created management problems never encountered before by professional wildlife men, and a great amount of research was necessary before the underlying causes of these problems could be determined and counteractive measures could be suggested. The next portion of the report will outline these problems and the research which was conducted to find solutions to them.

Table 1. Legal kill of deer in Pennsylvania from 1915 to 1949 inclusive

Year	Legal Bucks *	Anterless Deer **
1915	1,287	0
1916	1,732	0
1917	1,725	0
1918	1,754	0
1919	2,939	0
1920	3,300	0
1921	4,840	0
1922	6,115	0
1923	6,452	8
1924	7,778	126
1925	7,287	1,029
1926	11,646	1,295
1927	14,374	0
1928	0	25,097
1929	22,822	0
1930	20,115	5,979
1931	24,796	70,255
1932	19,724	0
1933	20,480	0
1934	21,137	0
1935	23,802	46,668
1936	18,084	0
1937	39,347	0
1938	0	171,662
1939	49,106	14,581
1940	40 995	145,580
1941	19.271	0
1942	30,860	0
1943	23,931	14,951
1944	28,411	0
1945	24,575	1,085
1946	31,110	4,209
1947	31,475	63,569
1948	33,608	0
1949	46,602	84,121
Total	641,480	650,207
*Grand Total		1,291,687

*Two or more points to one antler beginning in 1923.

**About one male to every four females.

MANAGEMENT PROBLEMS AND RESEARCH STUDIES

COINCIDENT with the phenomenal increase of the deer herd from 1915 to 1940 was the change in the forests of the state from a "brush stage" to a "pole stage." This natural growth resulted in an ever-diminishing food supply for the herd, even though, at the same time, the increasing number of deer required more and more food to survive. The reduction of natural browse is caused in two ways as forests mature: (1) by simply growing out of reach, and (2) by forming a closed canopy which shades out and kills many of the shrubs and herbaceous plants beneath. Since the timber crop has a much greater value as a natural resource than the game crop on most land, it would be highly impractical and indeed foolish to attempt to prevent the maturation of the forests by burning or cutting merely to preserve the deer herd at an exceedingly high level.

What Is Carrying Capacity?

This loss of food as the trees become 20, 30, or more feet high adversely affects the carrying capacity of the range. Many readers will shy at the term "carrying capacity" and may call it a "meaningless technical term used by wildlife men to confuse the average sportsman." Actually it is a simple term which should be familiar to any hunter, rancher, or farmer. It merely refers to the number of animals that can be supported upon a certain area of land. For instance, a farmer knows that he cannot expect ten acres of pasture to keep a hundred head of cattle fat and well-fed. He knows that if he puts too many cows on this ten acres he will have to give them supplemental feed at the barn or expect them to lose weight and give less milk. Also, he knows from experience that too many cattle will overgraze the grass and permanent damage may result and then his pasture will support fewer cattle than before. This is carrying capacity. Field research has shown that, if food conditions are ideal, as when a hardwood stand is in the brush stage, as few as eight to ten acres may support one deer. However, as the brush becomes larger, and less browse is available, it may require 25 acres of land to feed one deer, and in large timber where the forest floor is nearly bare, a deer may not find sufficient food on 50 to 100 acres the year around.

So, in the same manner as a western rancher has to determine how many cattle he can raise on the land he owns or controls, the wildlife manager must decide how many deer can be supported by the forests of the state. *Unfortunately, the herd has been maintained above the level of the true carrying capacity since the early* 1920's.

Reduction of Total Carrying Capacity

It has been mentioned already that when too many cattle upon pasture land cause permanent damage from over-grazing, the same acreage will support fewer cows than before the mistreatment occurred. The same thing holds true for the deer range. Aldo Leopold, Professor of Wildlife Management at the University of Wisconsin, who before his death in 1948 was recognized as one of the world's outstanding wildlife technologists, made a deer survey of the entire United States and reported that 30 of the 48 states were faced with deer problems. For all 30 of these states he made the following statements:

"Starvation occurs because these overcrowded deer kill their natural food plants by overbrowsing. *These plants are then replaced by plants of little or no food value.*

"After the pyramid-to-starvation cycle has run its course, *the (carrying) capacity of the deer range is estimated to be from near zero to one-half of its normal capacity.*

"Reduction of the herd is the only way to prevent a tragic shrinkage of both the herd and its range.

"The only satisfactory way to accomplish a reduction is to shoot female deer."

No finer example to illustrate the truth of these statements can be found than the poignant lesson in conservation blindness provided by the history of the Kaibab Plateau herd. After almost complete eradication of mountain lions, wolves, and other natural enemies of the deer from the Plateau, the herd began to increase at a rapid rate. The first warning of over-population in 1918 was unheeded and by 1924 the herd of 100,000 was suffering extreme mortality from malnutrition. By 1931 only 20,000 were left and by 1939 a mere 10,000 deer were able to survive on the entire area. It was estimated that 90 per cent of the carrying capacity had been lost by over-browsing during the years of over-population, and that if control had been initiated in 1918 the herd could have been maintained at 30,000 head rather than the pitiful 10,000 left after the irruption.

Speaking specifically of Pennsylvania, Dr. Leopold said: "In 1931 the Pennsylvania herd was estimated at 800,000 and the carrying capacity of the range at 250,000. *The several doe*

"Starvation occurs because these overcrowded deer kill their natural food plants by overbrowsing."

Pole stage timber offers little or no food for deer. Where could a whitetail reach the required buds and twigs in the pole stage forest shown here?

seasons prevented a serious die-off, but not before thousands and thousands of acres of good range was spoiled." He estimated that 50 per cent of the total range in Pennsylvania had been depleted.

"But not before thousands and thousands of acres of good range was spoiled." Think of the implications of such a statement by an unbiased observer who is recognized as an authority in the field! It is bad enough that thousands of acres have already been spoiled, but, even worse, this destruction is continuing unabated and more and more thousands of acres are being destroyed at the present time.

How is the range spoiled when the carrying capacity is exceeded? The answer is simple! It might be well to explain first that deer are normally browsing animals instead of grazing animals. That is, they prefer and require the succulent twigs, leaves, buds, and bark of woody plants for health and growth and eat a comparatively small quantity of herbs and grasses unless forced to it by browse shortages. Because there is always an abundance of green forage and new sprout growth during late spring, summer, and early fall in Pennsylvania, there is seldom a food deficiency during these seasons, but during the colder months when deer must depend upon twigs, buds, and bark for sustenance there may be a decided shortage. During the coldest part of the winter, particularly if snows are deep, deer will move from the tops and sides of the mountains into the sheltered valleys and spend the remainder of the winter there *even though many may starve because of a lack of food.* Because of this "yarding" habit, the winter range is greatly restricted and may constitute only a fraction of the warm-weather range. Thus, the food problem may be confined to 3 or 4 million acres of forest land during

Good browse conditions are found when the forest is in the sapling or sprout stage, when young trees are abundant and within reach of the deer. (Above—effects of bulldozing.)

midwinter instead of the 10 to 15 million acres occupied during the warmer months. If there are 500,000 deer in the state all crowded onto 4 million acres, this means a population of one deer for each 8 acres for about 3 months. Even with the browse supply at a maximum, the land area could barely support this concentration. After a few years of over-crowding and over-browsing, the smaller deer begin to die on these concentration areas, and during especially severe winters such as that of 1935-36, thousands and thousands of deer can be found dead and dying from malnutrition or starvation. During the 1935-36 winter it was possible to count from 50 to 100 dead deer while walking for a mile or less along some of the state's mountain streams. Today, nine out of ten of these valleys are "eaten out," and they have become death traps for the deer which remain. *To permit animals to suffer in this manner and to permit this waste of a natural resource is surely not judicious management!*

Almost without exception, the carrying capacity of these yarding areas just mentioned is near zero. The thousands and thousands of acres of spoiled range mentioned by Leopold referred almost entirely to these wintering valleys. But what is happening to the browse supply on other parts of the range? It, too, is rapidly being stripped and peeled of every vestige of succulent browse. Nearly all palatable shrub species within easy reach of the deer have been killed back, and many species have been nearly eradicated. The beautiful hobblebush or moosewood *Viburnum alnifolium* Marsh (Gray), formerly abundant in the mountains of Pennsylvania, is now a comparatively rare plant. As long as the population remains above the carrying capacity, the amount of available browse will decrease each year, and the land will support fewer and fewer deer. As this

shortage becomes increasingly acute, the deer die from malnutrition and there is a gradual reduction of the population. It is then that many hunters place the blame upon the Game Commission and say that the last "doe season" ruined the hunting in their sections. *Without food, deer or any other animal cannot survive. With or without an antlerless season there is bound to be a reduction of deer upon such areas. And once the food is gone, the deer cannot nor will not increase again even if given complete protection until such time as the browse supply is restored.* Unless the numbers of deer are controlled in accordance with the food supply, they literally "eat themselves out of house and home" and the carrying capacity can, and often is, reduced to almost nothing.

From past experience it could be predicted that, if the Pennsylvania deer herd were given complete protection for a period of ten years and no deer were cropped whatsoever, at the end of this time the browse supply would be nearly completely destroyed, the carrying capacity would be near zero, and no more than a few, degenerate, diseased individuals would be left on the primary range. *It is probable that deer could be eradicated more quickly from the state by providing complete protection than by removing all protection and permitting them to be killed at any time and in any manner.*

Beside the decrease in total amount or volume of food that can be produced by the land when deer are over-abundant, there is also a reduction in the quality of the food produced. It is only natural that the deer will browse the most palatable and most nutritious plants first and hardest. If new sprout growth appears or if a seedling breaks through the ground, either is eaten almost immediately. Gradually these desirable species have been killed and have been replaced by far less nutritious and palatable species. On many areas the normal diet of the whitetail has been greatly changed and, even though they may still be ingesting a large quantity of browse, many essential vitamins and other food substances may be lacking. So, the reduction in the food supply may be qualitative as well as quantitative, and this may just as effectively limit the carrying capacity of the range and the health and size of the deer occupying it.

Reduced Populations of Certain Small Game Species

Most deer hunters also hunt small game and are as much interested in the welfare of rabbits and birds as they are in that of the deer. For this reason, hunters should know how an over-abundance of deer can destroy the habitat of certain small game species and cause a marked reduction in their numbers.

The cottontail is probably first to go when a range is over-browsed. There is a direct competition for food, and the destruction of ground cover by deer leaves the cottontail vulnerable to predation. Deer hunters have only to think of their own hunting territory to realize that in most places they will see more deer than rabbits during a day's hunt. Over much of the mountain deer range, rabbits have been nearly extirpated. Many of these same forest areas supported high cottontail populations 30 or 40 years earlier.

At the Loyalsock Wildlife Experiment Station in Lycoming County, about 50 deer were placed in a 50-acre experimental pen during the spring. This tract had always contained excellent rabbit cover, and a large number were live-trapped annually for restocking upon public shooting grounds. There appeared to be little change in the rabbit population the

first winter, but by the second winter the natural browse was gone, and, although most of the rabbits apparently moved out of the area, a very few remained. These existed by barking trees up to eight inches in diamter, including basswoods, soft maples, black alders, witch hazels, and the heavy butts of a number of grape vines. This browsing was decidedly unusual and undoubtedly resulted from the rabbits' desperate attempts to prevent starvation. *The third winter no rabbits occupied the inclosure.*

In the north-central part of the state an area comprising about 1,200 acres was enclosed within a deer-proof fence. At this time the estate contained no deer and the rabbits prospered and the overseer reported being able to count 20 to 30 cottontails on the one-mile length of road nearly any evening. Then a few deer were released within the inclosure, and for the first two or three years the rabbits appeared to be holding their own. Then, as the deer increased, the cottontails began to disappear until finally the deer reached a saturation point where even they had to be fed artificially. At that time the overseer reported that for six weeks at a time he would not see a single rabbit on the same stretch of road. During the entire period there was no hunting of any kind within the inclosure.

Squirrels, depending mainly upon the mast crops (acorns, beechnuts, and various hard-shelled nuts) for food, are often hard-pressed to find sustenance to hold them over the winter and early spring, because by midwinter the deer may have eaten nearly the entire supply.

Ruffed grouse, wild turkeys, and varying hares must be included among the small game species which cannot compete successfully with the white-tailed deer. When the range is overbrowsed, much of the smaller vegetation necessary for protection against predators, for nesting, and for a large portion of the food supply is removed. There is also the more direct competition for acorns and other mast crops. Wild turkeys are not so seriously affected as the grouse be-

The cottontail rabbit is probably the first to go when a range is overbrowsed.

cause they have fewer natural enemies and are therefore more tolerant to open timber.

The hunter must decide whether he wants high deer populations at the expense of other forest-dwelling game or whether he wants to have reasonable numbers of both.

Decreased Forest Reproduction

The restriction of natural reproduction of certain desirable forest tree species by deer has already been mentioned. The normal second-growth forest should contain all stages of growth from tiny seedlings to trees representing the maximum age of the stand. When the larger trees are cut for timber, chemical wood, or paper wood, the growth of the saplings and seedlings is greatly accelerated and these produce the next crop of marketable timber. However, because of the destruction from over-browsing, this reproductive growth is lacking or is present in insufficient quantity, in many cases, to reforest the land adequately. Also, stump sprouts are clipped as fast as they appear on the more palatable species, and reproduction by this method is greatly reduced.

Small-scale lumbering is particularly dangerous because the underfed deer of the surrounding territory flock into these small clearings and eat nearly every new shoot which appears. Only the hardiest or least palatable species can survive under these conditions, and the new growth may have far less potential market value than that just removed. The same unfortunate occurrence follows forest fires, and, when the same region is burned several times in a few years, it may partially revert to prairie grassland. Certain sections in the northwestern part of the state are now no more than 50 per cent forested with the intervening spaces occupied by grass and bracken fern, and one or two more fires on the same

Table 2. Reduction of the carrying capacity of the range by overbrowsing.

THE NUMBER OF WOODY STEMS BETWEEN ONE AND FIVE FEET IN HEIGHT INSIDE AND OUTSIDE FENCED AREA

Species	No. of stems on ¼ Acre—Inside Fence	No. of stems on ¼ Acre—Outside Fence	Difference
Laurel	945	486	459
Sassafras	401	10	391
Chestnut	117	73	44
Aspen	35	0	35
Red maple	49	15	34
Chestnut oak	14	10	4
Red oak	2	0	2
Cucumber	1	0	1
Ilex (holly)	57	1	56
Witchhazel	63	41	22
Huckleberry	36	16	20
Maple leaf viburnum	6	1	5
Azalia	68	6	62
Gooseberry	1	0	1
Honeysuckle	2	0	2
Raspberry	1	0	1
Total	1788	639	1149

From McCain, 1940

Studies made by enclosing small tracts within deer-proof fences have demonstrated the destructiveness of an uncontrolled deer herd upon natural reproduction and artificial plantings.

areas may temporarily terminate the timber productivity until the deer are removed and the land is replanted.

The reforestation programs of the Department of Forests and Waters, the Pennsylvania Game Commission, many industrial concerns, and private individuals have failed in regions where deer are abundant. The survival of 1,600,000 seedlings planted by the Game Commission to provide food or cover for wildlife was checked, and only 28 per cent were living at the time the survey was made. Most of these were found on agricultural areas somewhat removed from the true deer range. Studies made by enclosing small tracts within deer-proof fences have demonstrated the destructiveness of an uncontrolled deer herd upon natural reproduction and upon artificial plantings. One study revealed that 91 per cent of red pine stock had been killed on the unfenced area while only 11 per cent had died from frost and other causes inside the fence. Even the surviving pines at the time of the count on the unfenced tract were badly browsed and all were expected to succumb within a short time. Stem counts were just as revealing and a table from studies made in the Allegheny National Forest (McCain, 1940) is presented (Table 2).

The lumber industry has a potential value of many hundreds of millions of dollars, and thousands of men find full or part-time employment working in the woods or with wood products. *To sacrifice this indispensable natural resource and to jeopardize the future of the lumber industry merely because a few shortsighted, uninformed hunters feel that a reduction of the herd will ruin their sport is not far from criminal, particularly when, as will be shown later, a reduced number of deer would actually improve the hunting and save the forests from destruction.*

Crop Damage

Another common symptom indicating that the carrying capacity of

the range has been exceeded is that of agricultural crop damage. When the forests cannot supply sufficient food for the number of deer occupying them, then these deer have no other recourse except to turn to agricultural crops for additional sustenance.

It is difficult for the average city hunter to realize that crop damage is an important considertaion in deer management. He is likely to be unsympathetic because he does not know the extent of the economic loss suffered by many landowners, and when he does hear stories concerning property damage he is inclined to believe that they are greatly exaggerated. Deer damage may be quite variable in its degree of severity—it may be no more than the trampling of a few stalks of grain or it may be the complete destruction of a ten-acre field of buckwheat. Orchardists, truck farmers, and even the home gardener may suffer along with the regular farmer. Deer have learned to dig potatoes, to tear corn shocks apart, and to eat nearly anything that can be grown in a garden with the possible exception of onions.

When investigating deer damage complaints, the game protector will often have a farmer's wife burst into tears while telling of their struggle to live—hardships resulting from crop loss due to excessive deer damage. At best a farmer can hope to make no more than a meager living from marginal land—and, when his entire buckwheat crop may be lost, much of his winter's supply of potatoes dug out and eaten, and his truck patch ruined, this loss may mean the difference between success and failure. Many "hill farmers" have been driven from their land because they could no longer compete successfully with the deer and make a living for their families.

The very practical, unsentimental hunter will say that it is a good thing to force the abandonment of this marginal land because the people cannot make a decent living from it anyway, but many of these people are happy with their lot and ask nothing better from life. *Who is to judge whether one man's sport is worth more than another man's peace and contentment?*

Of more direct concern to the hunter is the fact that many thousands of

Scenes such as this are common to farmers in areas of Pennsylvania which hold too many deer.

deer, including magnificent bucks, are killed for crop damage each year Individual farmers have been known to kill upwards of 100 deer in a single growing season. These should have provided recreation for nearly 100 hunters had they been harvested during the previous hunting season! These men do not want to kill deer in large numbers on their farms because it is time-consuming, expensive, and sometimes wasteful, but they are driven to it in a desperate attempt to save their crops and to live. Most of these farmers are tired of this ceaseless killing and tired of venison!

Abnormalities of the Deer Themselves Caused by Malnutrition

(1) Reduced body size. It has been mentioned already that because the carrying capacity of the range has been exceeded, both in the past and at present, there is likely to be an insufficient quantity of food for proper growth and health at least during some periods of the year. Also, because many of the most desirable food plants have been nearly eliminated by the deer, there is probably a qualitative deficiency of food as well, which means that the deer may not be getting enough of the essential minerals, vitamins, fats, and proteins for proper growth and health.

It is known from experiments at the Wildlife Experiment Station and from field weight studies over a period of years that the average body weight of deer has been retrogressing steadily for the past 20 to 30 years. Before deer became excessively abundant, and when food was still available in large quantities, antlered bucks would commonly weigh over 200 pounds hog-dressed with an estimated average of 150 pounds or more. Weights taken by the research personnel over several seasons prior to 1941 showed that the average legal buck then weighed only about 105 pounds with many as low as 80 to 90 pounds. The largest deer among the several hundred weighed during these field studies tipped the scales at 196 pounds hog-dressed. The next highest weighed 177 pounds and only a very few exceeded 150 pounds. The largest adult does weighed 130 pounds or less hog-dressed and averaged between 70 and 80 pounds. Fawns of the year killed during the season averaged between 40 and 50 pounds with one individual as light as 18 pounds.

Experiments with fawns held in pens revealed that when these young animals were improperly fed during the first winter (which would be typical of much of Pennsylvania's deer range at present) they became stunted and never attained the size of the well-fed control animals even though later they were given a maximum of good food.

Fawns, taken alive in the wild from areas where adult bucks were averaging about 105 pounds hog-dressed and reared in captivity at the Experiment Station on high-quality food, were found to weigh as much as 265 to 280 pounds live weight by the third year. If these figures are reduced by 21 per cent for hog-dressing, the large bucks would still weigh over 200 pounds—nearly twice the weight of the average buck reared in the wild from the same stock.

Reduced Antler Size

Antler size has followed nearly the same pattern as body size during the past forty years. The massive ten- and twelve-point racks of former years are now seldom seen, and spike bucks are becoming more and more common. *Any spike buck is an abnormalty, reflecting the over-browsed condition of the range, and "spikes" are common only when the animals are improperly nourished. That is, bucks should normally have from four to ten points the first time they produce antlers at eighteen months of age.*

Poorly-fed yearlings almost without exception will produce only spikes.

Severinghaus and Tanck (1947 and 1949) in comparing the antler size of the deer from the central Adirondack region of New York, where winter losses are chronic, with those from the southern tier counties of the state, where the browse supply is adequate, found that a startling difference in antler development exists. *On the Adirondack range, which is closely comparable to the primary deer range of Pennsylvania in respect to the paucity of good browse, only 37.8 per cent of the 18-month-old deer checked during the hunting season had two or more points to one antler. On the other hand, 85.7 per cent of the bucks of this age inspected in the Southern Tier were legal according to Pennsylvania standards. These investigators also found that this 18-month age group provided 78.1 per cent of the legal bucks killed during the 1948 season in the Southern Tier counties.* It is obvious from a study of these figures that, the poorer the food supply, the fewer legal bucks there will be for harvesting during the hunting season.

Feeding experiments with young bucks have proved that antler size and the number of points is nearly directly proportional to the quality and quantity of the food supplied. Poorly-fed yearlings almost without exception will produce only spikes, fairly well-fed animals usually will have a total of two to four points, and well-fed animals may have as many as 8 to 10 points.

It has also been determined by experiment and observation that poorly-fed deer will often shed their antlers in November and early December instead of holding them until the normal time from February to April. This means that many hundreds of otherwise legal bucks are "baldheaded" during the buck season, and the numbers of deer available to the hunters are decreased by just that many.

Reproductive Abnormalities

When adequately nourished, adult does will normally give birth to twins or triplets. Most Pennsylvania does do not reproduce the first year, and will seldom have more than a single fawn the second year. If range conditions are nearly ideal, it appears that as many as 30 per cent or more of yearling does may fawn, but in Pennsylvania it is believed that a very small percentage, because of nutritional deficiencies, reach the size and sexual maturity necessary to breed at six to seven months of age.

Some years ago when deer were less abundant and browse more plentiful, most does would be seen accompanied by twin fawns. Today, twins are the exception, and single fawns are the rule. Many does do not reproduce at all, either because they remain unbred or because they lose their fawn during or following the "crisis period" of February and March. It has been found also that the greatly unbalanced sex ratio (as many as 6, 8, 10, or more does to each adult buck) has resulted in some does remaining unbred following the regular rutting season. It is estimated that

FORM 68-301
2000M-6-60

SUBJECT: Deer Investigation

TO: Thos. D. Frye
Executive Director

FROM: Robert [illegible] McDowell, Chief
Wildlife Research Division

Below is a summary [illegible] findi
in Potter County, Pleasant [illegible] Township

We checked two [illegible] of stream
two miles, on March 27 and [illegible] found
22 were fawns; 4 were mature, 3 ye

Of the 4 does, [illegible] were ca
does had only one fawn, [illegible] and
not pregnant, one was [illegible] doe that
The other was a yearling [illegible] had

All deer were [illegible] ing from
examining the marrow of [illegible]. N
pathological conditions [illegible] were
nasal botflies. A few [illegible] were foun

These animals [illegible] found i
with hemlock clumps. [illegible] als we
immediately adjacent [illegible] ttings.
made in January and [illegible] will n
deer.

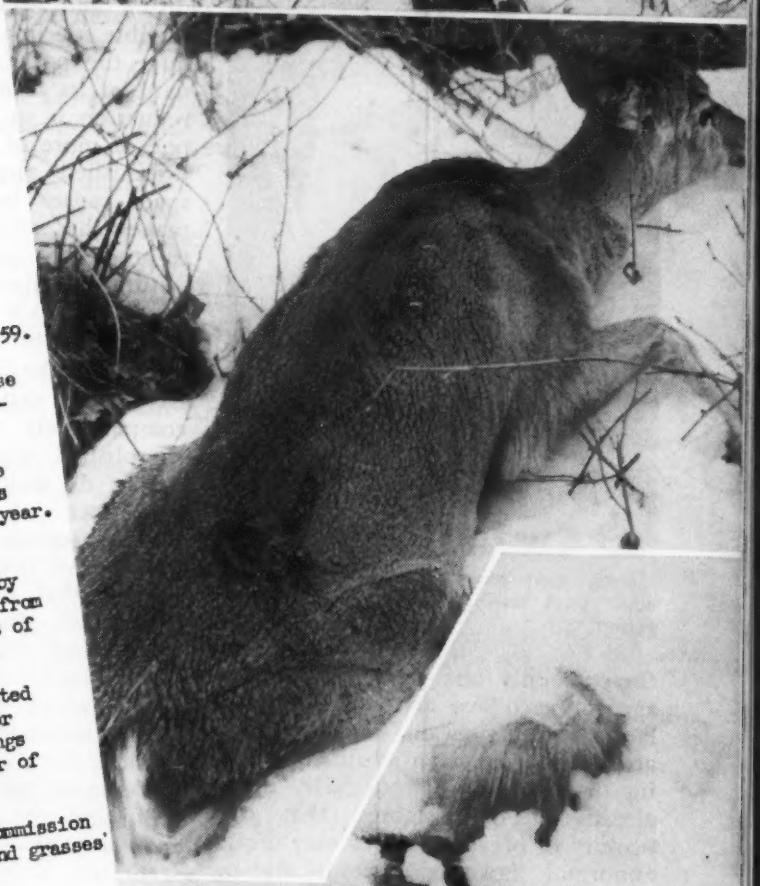
Animals [illegible] containe
employees), poor [illegible] rce (f
in their stomachs.

The deer [illegible] t noti

On the [illegible] to Game
3 dead fawns in a [illegible] cutting

COMMONWEALTH OF PENNSYLVANIA

March 30, 1950



Thief
vision

findings of deer conditions
Township, State Game Lands No. 59.

stream in Fish Hollow. In these
found 26 dead and dying deer —
3 yearlings, 1 older.

were carrying young. Both these
and one a doe. Of the 2 does
that had fawns the previous year.
had never had fawns.

ing from malnutrition as proven by
ear. No animals were suffering from
ere were no heavy manifestations of
re found in very small numbers.

found in a sheltered valley, dotted
als were all found either in, or
ings. It is evident that cuttings
will not maintain a large number of

contained corn (placed by Game Commission
ance (from roadside plantings) and grasses.

just noticed dying on March 10.

te Game Lands, in Weimer Hollow, we found
cutting.

Some does may actually not meet an adult buck during their normal breeding period.

there is only one buck of breeding age for each 200 acres of mountain land. For this reason, some does may actually not meet an adult buck during their normal oestrous cycle. It has already been explained that this scarcity of breeding bucks may create abnormal fawning periods during January and September. Fawns killed during antlerless seasons weighing as little as 18 to 25 pounds hog-dressed are September-born.

The important consideration here from a management standpoint is that 50 well-fed does will produce as many, and perhaps even more, fawns as 100 poorly-fed does.

Winter Mortality

Mother Nature has methods of her own for managing her many charges. Sometimes her methods appear to be hard and cruel, but she accomplishes her purpose without hesitation, argument, or legislation. When any animal population exceeds its food supply there is always a reduction—sometimes only enough to correct the condition and other times a sweeping, terrible decimation which may reduce the population to only a remnant of its former abundance. This reduction is usually accomplished in one or more of three ways: (1) by a diminished alertness, strength, and speed caused by malnutrition which makes the animals more vulnerable to predation; (2) by a lowering of the natural resistance to disease which may result in a widespread epidemic; and (3) by starvation.

Because the more potent predators have been extirpated or controlled, comparatively little reduction is accomplished through predation and, so far, no serious disease has struck the deer of Pennsylvania. But through starvation many, many thousands have been removed from the overcrowded range in an effort to compensate for man's mismanagement. And Mother Nature exhibits her profound wisdom by taking the fawns, which would not reproduce for two seasons but would eat as much as older deer, and leaving the mature bucks and does as a guarantee of rapid and certain increase in case the environment should become more favorable.

The thousands of deer which die during severe winters, and the disgraceful waste of a natural resource, have already been described. How much better it would have been had these deer been harvested by the hunters during the hunting season! It would have meant success for several thousand who returned home empty-handed. *Even the most stubborn opponent to antlerless seasons can surely see merit in harvesting deer which are going to suffer a slow, lingering death before the winter has passed!*

Disease

Deer are surprisingly free from disease and parasites when properly nourished. Within recent years in Pennsylvania, several maladies have appeared which were formerly of little or no consequence. The nasal passages of undernourished deer may become so clogged with the larvae of the nasal bot fly that the animals will lose weight from the constant annoyance of the chewing, crawling mass and eventually die. Large ulcerated pockets in the tongue, lips, cheeks, and jaws will sometimes become impacted with finely-chewed food and, as these grow in size and the food material decays and ferments, the deer finally dies.

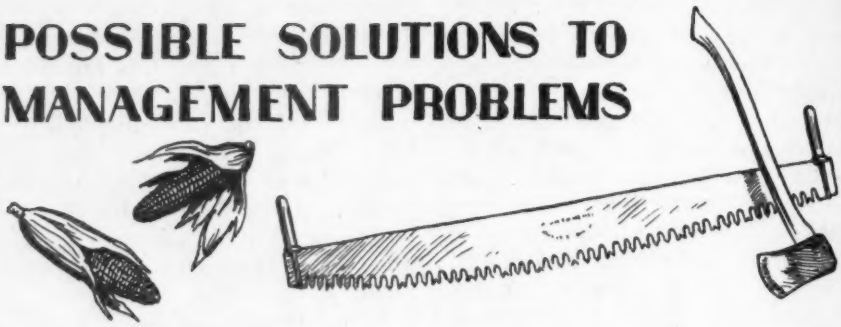
Certain endoparasites, such as flatworms and roundworms, are sometimes found in large numbers in the digestive tract, but it is not known whether these organisms are an important cause of mortality.

Deer are occasionally killed or found dead with large tumors distributed over their bodies. Abnormal growth of the hooves has been reported, and one specimen had upturned hooves which were fully twelve inches long.

Even though disease has not yet become a significant factor in whitetail management in Pennsylvania, it remains a constant threat. Overpopulation is conducive to disease, often in epidemic form, and there is always the possibility of some virulent pathogen striking the herd and reducing it to almost nothingness in a few short months.

Deer are occasionally killed or found dead with large tumors distributed over their bodies. Fortunately, only a few cases have been reported each year so far.

POSSIBLE SOLUTIONS TO MANAGEMENT PROBLEMS



THE problems posed by a herd which has been maintained in excess of the carrying capacity of the range have been presented. In this portion of the report, remedial measures as suggested by the professional wildlife worker, and by the deer hunters of the state, will be discussed. A sincere attempt will be made to show why certain of these suggested remedies will not work, and why others appear to offer the best possible solutions to the problems under the present circumstances and within our present knowledge of the animal. The same outline will be followed as was used in stating the management problems.

The Forest Matures

Only two possible alternatives present themselves for solving this problem: (1) to prevent the forests, or a portion of them, from maturing, or (2) to regulate the number of deer in proportion to the amount of food supplied by these forests in different stages of succession. The second alternative means a reduction of the herd well below its present level, and it is to this that so many deer hunters object.

In order to maintain the forests in peak deer production, it is necessary to either cut or burn whenever the timber begins to grow out of the brush stage into the pole stage. This means a rotation every 15 to 25 years. Let us look at some of the difficulties, costs, and possible benefits (or non-benefits) of this kind of range management.

Bulldozing

Probably the cheapest method discovered so far to remove older trees and regenerate brushy growth without burning is by bulldozing. On approximately 1500 acres experimentally processed, the average cost per acre was $11.92. It is known that about 12 acres of this kind of habitat is necessary to sustain a single deer on a year-round basis and over a period of years. This means that it has cost as much as $140 to provide food for one deer. If this area remains productive for 20 years, the cost per year would be about $7 per deer. However, it is possible that newer methods of bulldozing could reduce this cost in the future.

Although the cost at present is high, it is perhaps not the most important limiting factor. On all but the few hundred thousand acres owned by the Game Commission, the timber crop is considered to be far more valuable than the game crop. State and National Forests and privately-owned land will never be sacrificed to deer production. Even on the 850,000 acres of Game Lands, there are those who feel that timber production should not be eliminated entirely from management plans. Even if every available acre of Game Lands not too rocky nor too steep to

bulldoze was utilized, this acreage would not support more than about 40,000 deer on a sustained basis. Secondly, when relatively small areas are treated by bulldozing, deer concentrate upon these "oases" and often within a few months nearly all of the valuable browse species have been destroyed so that their food-producing potentialities are almost nil. Also, when these areas become reforested there may be a pronounced lack of certain preferred species because of the deer's selectivity, and, if bulldozed the second or third time, the total food production may be greatly diminished. Even worse, heavy browsing is likely to decrease the stem count upon the areas, and a part of this land may revert to grass or bracken fern.

Cuttings

Cuttings made specifically for deer at an even higher cost than bulldozing are likely to undergo the same retrogression of productivity as the bulldozed areas. The most practical plan at present appears to be one of harvesting the timber at regular intervals—especially as pulpwood, chemical wood, or other uses which insure a regular harvest every 30 to 40 years. Usually this permits the operation with little or no drain from the Game Fund—that is, the management is self-supporting. It is admitted that less intensive measures like this will not maintain the same high population as bulldozing or cutting every 15 to 20 years, but there is less likely to be a permanent damage to the forest, it is far more economical, and the land will continue to support good numbers of deer.

Burning

Burning has been advocated by many sportsmen as a quick and inexpensive way to regenerate deer food

Probably the cheapest method discovered so far to remove older trees and regenerate brushy growth without burning is by bulldozing. But even this method has cost as much as $140 to provide food for one deer per year.

on forest land. In order to accomplish the intended purpose, the fire must be hot enough to kill the larger trees but, when a fire is this hot, it may endanger surrounding timber land and perhaps human lives unless precautions are taken to prevent its spreading. This means preparing fire lines and having men and equipment on hand for emergencies, and all of this adds greatly to the cost. Repeated burnings over the same area may cause an undesirable loss of organic matter in the soil and a pronounced reduction of the fertility and productivity of this soil. Much land which has been burned time and again will grow little but bracken fern, various grasses, and other plants of little or no value to deer for food. *Burning is probably the least desirable method for range management.*

Harvesting the Timber

It appears that a regular timber harvest is the best method now known for managing the forested regions of the state for deer even on Game Commission-owned land. It also appears that in order to maintain the productivity of this land and to prevent permanent damage to the natural plant growth, the numbers of deer occupying these managed areas will have to be controlled at a proper level.

Reduction of Carrying Capacity

Bulldozing, cutting, and burning have already been discussed under the preceding topic. All of these operations have been suggested for increasing the food supply and the carrying capacity of the range but, as was pointed out, all have definite limitations.

Winter Feeding

Another possibility is winter feeding. This effort to supplement the natural browse in the forests is intended to save deer from starvation during the crisis period of late winter. One of the methods of winter feeding most used by sportsmen is that of cutting trees in the stream valleys in which deer are wintering and permitting the deer to browse the twigs. The deer are often so hungry that they will approach within a few yards of the workmen to feed. However, in spite of the fact that the deer respond to this kind treatment and the hunters show their willingness to help, there are drawbacks to this procedure. First of all, once a tree is cut in these valleys there is little chance for reproduction from seedlings or stump sprouts because the deer continue to eat all new growth as soon as it appears. For this reason, it is only a matter of time until there are no more trees of the right kind available for this purpose. Secondly, even with many willing hands, only a small portion of the deer range can be covered effectively, particularly when the ground is covered with deep snow and deer are most in need of help. Emergency feeding was tried on a large scale during the 1935-36 winter, when nearly $28,000 was spent for feed and labor, but deer starved by the thousands in spite of this effort.

Recently, airplane feeding has become popular. This method has the advantage of reaching the more inaccessible spots with reasonably large amounts of food but, here too, there are objections. For one thing, it is possible that a portion of the food will not be found by the deer and the other game because the force of impact may bury it in the snow. But, more important, is the prohibitive cost of feeding so large a herd even if the mechanics of covering effectively so large an area could be solved. Gerstell (1938) estimated that a herd of 500,000 deer would consume nearly 1,000,000 pounds of food per day throughout the winter at a known rate of 2 pounds of food per 100 pounds of deer a day. If only one-fourth of the herd was to be fed in

this manner, it would cost in excess of $25,000 a week for ear corn alone. Since the crisis period covers a span of eight to ten weeks, the cost of maintaining these deer would be immense.

Ear corn seems to be the most desirable food item for emergency feeding during winter. Most hay will be uneaten unless the deer are extremely hungry and, if they do eat a quantity of it, they are very likely to die from gastric disturbances. Probably more deer have been killed by feeding hay than have been saved by it! Mixed concentrate feeds are far too expensive to be used for this purpose.

An examination of the various methods suggested and used to prevent, or to compensate for, a reduced carrying capacity of the range reveals that few are workable on a practical basis, and that the ultimate solution will be a reduction of the herd to a level comparable to the carrying capacity.

Reduced Populations of Certain Small-Game Species

It is unnecessary to state that only the elimination of the severe competition by deer can restore cottontails, snowshoes, and grouse in good numbers to much of the forested land of the state.

Decreased Forest Reproduction

After years of attempting every possible means to establish plantations of forest trees where deer are abundant, the foresters have thrown up their hands and no longer waste their nursery stock in such regions. As a consequence, no extensive reforestation program is being pursued over hundreds of thousands of acres of mountain land in the state.

The elimination of valuable timber species by overbrowsing continues, and it appears that normal plant succession may be entirely disrupted following one or two cuttings or burnings. The amount and value of future timber crops may be greatly reduced by the ravenous appetites of these animals. The people of Pennsylvania can ill-afford to sacrifice this important natural resource just because a few selfish individuals want to maintain deer in such numbers that they constitute an ecological menace.

It is obvious that the only answer to this problem is reduction of the herd!

Abnormalities of the Deer Themselves Caused by Malnutrition

As suggested by the topic heading, all of the abnormalities affecting the deer herd—reduced body size, reduced antler size, reproductive abnormalities, winter mortality, and disease—are the direct result of malnutrition. Logical thinking suggests that the only cure for these physical and physiological ailments is more food of better quality. This can be accomplished in two ways: (1) by increasing the amount of food available or (2) by decreasing the number of deer so that the present browse supply will adequately nourish the remaining individuals.

The difficulties and high costs of producing additional browse or supplying supplementary food artifically have been presented. It would appear from this that the most practical means of restoring the deer to normalcy would be by herd reduction.

Some hunters suggest that the reduced body weight and small antlers of Pennsylvania deer are caused by inbreeding, and that this condition could be corrected by importing new blood (in the form of large bucks) from other states. *There is absolutely no foundation for this supposition.* In the first place, inbreeding is nearly impossible when deer are so abundant, because this can occur only when an animal population is restricted in both numbers and range. Secondly, it is recognized by geneticists that inbreeding is never harmful if the original stock is pure, and there is no reason to believe that Pennsylvania deer may be otherwise.

MANAGEMENT RECOMMENDATIONS

THE discussions of the entire list of deer management problems have consistently pointed to one thing as the most plausible and most scientific solution to all of these conservation ills—*herd reduction and control.* Many deer hunters who read the preceding statement will immediately oppose any such suggestion because they feel that the proposed herd reduction will ruin their sport. Many sportsmen visualize a wholesale slaughter followed by years and years of poor hunting. *Fortunately, the wildlife manager's meaning of herd reduction is far different from this. He wants to reduce the number of animals held over the winter when browse is at a minimum and when deer may die by the thousands. There would actually be little or no reduction of the numbers of deer available for the hunting season. Instead of ruining the deer hunting as many sportsmen believe, the wildlife manager is confident that the hunting can and will be improved by herd reduction.* How can a reduction of the herd to a point commensurate with the carrying capacity of the range improve deer hunting and actually result in higher kills? Just plain common sense and a working knowledge concerning the whitetail supplies the answer.

Before commencing a discussion of recommended management measures, one suggestion should be made. That is, that the hunters of Pennsylvania should modernize their thinking. The Buck Law was passed in 1907 because it was felt that the herd would build up faster if does were protected. This was sound reasoning, and the herd did build up to numbers far beyond anyone's expectations. In 1907, and even in 1920, it was all right to think of the doe as a "sacred cow" and to protect it with all possible enthusiasm because the herd was still growing and spreading. But for the past 20 to 25 years the deer of Pennsylvania have had "growing pains" and the need for, or value of, protecting female deer has long since outlived its usefulness in management. In fact, this misconceived idea of providing eternal protection for does has done more to spoil the deer hunting of today and of the future than any other one factor. Can any hunter still feel that we need to continue to protect does to build up the herd to even greater numbers?

If the hunter is asked why he feels does should not be shot, he will answer that without a large number of does there cannot be a large number of buck fawns, and without a large number of buck fawns there cannot be a large number of legal bucks. They theorize that the more does there are the more bucks there will be for hunting. But under present range conditions, this hopeful philosophy is unfounded and *the exact opposite is more likely to be true.*

Suppose there are 500,000 deer in the state and the true carrying capacity is placed at 250,000 head as suggested by Leopold. Let us suppose further that 200,000 of the 500,000 deer are does of breeding age. It is positively known that when the range is overcrowded and food inadequate, the normal reproduction of deer is greatly reduced. Instead of the usual twins or triplets produced by adult does, single fawns are the rule and many does are not bred at all. Thus, the reproductive rate under these conditions is less than one fawn per doe and may be placed at about .75 fawns. This would mean that about 150,000 fawns would be born to the 200,000 does in our herd of 500,000. Added to 500,000 deer already existing upon the range, the fall population could become about 750,000 if nearly all of the fawns lived. Then during a regular buck season about 30,000 males would be removed and perhaps 720,000 deer would be left to winter on the already overbrowsed range. If the winter is severe, a large percentage of the fawn crop may starve, but if the winter is mild most of these animals may live to destroy great quantities of the ever-diminishing browse supply. By spring the deer are malnourished, susceptible to disease, incapable of normal reproduction, and lack the vitality to produce sizeable antlers. Under these conditions only about 40 per cent of 18-month bucks will be legal during the hunting season—in other words only about 30,000 of the 75,000 buck fawns born will be legal to hunt the following fall. Can we afford to feed 200,000 does just to produce 30,000 bucks a year for hunting?

Now what are the prospects if the advice of the wildlife managers is heeded? Suppose we reduce our herd of 500,000 to the carrying capacity of the range which has arbitrarily been set at 250,000 deer. This means immediately that there will be twice the quantity of food for each deer. We can assume that with this better nutrition reproduction will be nearly normal and that we can expect about 1.5 fawns per adult doe. If there were 200,000 breeding does in the herd of 500,000 then there should be 100,000 breeding does in a herd of 250,000. If each of these 100,000 does bears an average of 1.5 fawns, there will be born a crop of 150,000 fawns which is exactly as many as produced by the 200,000 underfed does. Now instead of a fall population of 750,000 deer, there are only 400,000, and the buck season may reduce this to 370,000 before winter begins. These 370,000 deer, having nearly twice the amount of food over the winter, should survive nearly any kind of weather. Also, because they have been well-fed, there should be little or no evidence of malnutrition, reproductive abnormalities, disease, and the other symptoms of overcrowding. *Also, and of greatest importance to the hunters, as many as 85 per cent of the male fawns should produce legal antlers the first year.* This would mean nearly 64,000 legal bucks for the following hunting season instead of the 30,000 produced under adverse food conditions. *This is how hunting can actually be improved by reducing the herd.*

But that is not the end of the story. What will happen the following year if only a few thousand bucks are removed from our optimum herd of 250,000 animals? At the end of the second breeding season they could number in excess of 500,000 again, and all that had been gained would be lost. *There is only one permanent and truly scientific solution to the deer problem—an all-age, all-sex harvest.*

If we go back to the reproductive figures for our hypothetical herd of 250,000, it will be remembered that 150,000 fawns were produced. *The only way to maintain the herd at this*

highly desirable level would be to harvest a number of deer each year of all ages and both sexes equal to the number of fawns surviving until the hunting season. In other words, if 75,000 to 125,000 of these fawns were to survive until fall, that many deer, does and bucks, could be killed during the hunting season without diminishing the number for the following season in the slightest. If properly managed, it is altogether feasible that from 75,000 to 125,000 deer could be harvested each season, year after year, and the general size, vigor, and quality of the herd held at a much higher level than at present. And, antlered bucks should be at least as numerous, and probably more numerous, than at present, and the inveterate buck hunter should have an even better chance to kill a fine trophy than before.

Is there danger of killing more than the desired number and reducing the herd below its optimum productivity? The answer is no, if seasons are regulated properly. If the big-game tags returned by the hunters show a slightly excessive kill for one season, then a shortened season the following year should compensate for the difference and restore the herd to full productivity. Past experience with doe and buck seasons should eliminate the possibility of serious blunders in harvesting the surplus.

The old die-hards who still think it is a sin and a shame to shoot a doe will object on the grounds that does are not as sporting as bucks. These men are much in the minority. There are two or three hundred thousand hunters who have found that does are just as hard to hit, are just as smart, can run just as fast, and are just as good eating as bucks. The only reason that does appear to be easier to kill than bucks is because they are usually from four to ten does for every antlered deer in the woods. The same men who declare that they will never shoot a doe, regularly shoot female rabbits, bears, squirrels, grouse, turkeys, woodcock, ducks, and a host of other game. Is there any real difference?

This recommended harvest of both sexes is neither new nor experimental. The Canadian Provinces, Maine, New Hampshire, and many other states over the country have always shot both sexes. These states and provinces have had few of the headaches suffered by states with Buck Laws, and their herds are maintained in good numbers and in top condition. Whitetails in these states and provinces will average far heavier and carry much larger antlers than our own scrawny, underfed deer.

It is probably desirable that the hunting should be limited to one sex at a time for safety. When both sexes are legal prey at the same time, careless hunters are likely to shoot at any supposed deer and endanger the lives of other hunters. If a hunter is forced to determine whether a deer has antlers or does not have them before he shoots, there is little likelihood that he will shoot a human in mistake for a deer.

In summary, there are at least ten ways in which the people of Pennsylvania could benefit from a reduction of the numbers in the wintering herd and an annual, sustained harvest of both sexes of deer:

(1) an increased amount of recreation through a greater annual harvest;

(2) and improvement in the size, vigor, and trophy qualities of the deer;

(3) a more favorable sex ratio and increased reproduction;

(4) a decrease in the number of spike bucks and a consequent increase in the number of antlered deer with three or more points;

(5) a near elimination of winter mortality resulting from malnutrition;

(6) a decrease in the undesirable effects of over-browsing upon forest reproduction and succession;

(7) a slowing of the rate at which the deer range is being ruined by overbrowsing, and the maintenance of a higher carrying capacity;

(8) a lessening of the amount of crop damage and the number of deer killed for damage;

(9) an increase of other forest-game species, particularly cottontail rabbits, varying hares, and ruffed grouse which are adversely affected by the overbrowsed condition of the forests; and

(10) a better relationship between the sportsmen of the state, the Game Commission, and the landowners who are suffering deer damage.

AN APPEAL TO THE DEER HUNTERS OF PENNSYLVANIA

IT IS HOPED that this bulletin has given the deer hunters of the state a better insight into the complexities of whitetail management, and, with this added knowledge, that they will be instilled with a greater confidence in the conscientious efforts of the men entrusted with their sport. These men deserve both credit and the confidence of the hunters because it was through their efforts that the deer were increased from a mere handful to a herd of a million animals within twenty-five years. After this proof of their management ability, why should they be denied the privilege of directing the future of the herd? Why should hunters doubt their ability and fight management measures proposed by them?

There is an old story of the man who, because of his good deeds, was visited by a good fairy. With a wave of her magic wand she caused an immense pile of gold coins to appear and, handing the good man a cloth sack, she told the man to take all he wanted. He eagerly fell to work filling the bag and soon had it over half full. The good fairy suggested that perhaps he had better be satisfied with that much because the cloth might give way and he would lose his wealth but, in his greed, he continued to add more and more of the gold pieces. A little later, he was warned again that there was a limit to the capacity of the bag and that he should now be content. But the sight of the great pile of gold had blinded him to reason and he stubbornly persisted in taking more. Suddenly the seams parted, the fairy and gold disappeared, and the good man was left "holding the bag."

If we modernize our story and have our good, but shortsighted, man represent the deer hunters of Pennsylvania, the bag our deer range with its limited capacity, the gold pieces our deer, and the benefactor the Game Commission, is there not a close analogy? Were the deer hunters satisfied when the deer population was doubled from 1913 to 1915, doubled again by 1919, doubled again by 1921, again by 1924, again in 1927, and again and again until at its peak the herd was estimated to have increased five hundred fold? Has not the Game Commission warned repeatedly for the past twenty years that the bag contained more than it could safely hold? Have not the seams begun to break and the gold pieces started to trickle through (winter mortality)? And is there not imminent danger that the whole bottom may fall out if some of the pieces are not removed and the strain relieved?

It is for the hunters to decide whether their sport of the future and that of their children shall be based upon scientific study and management by well-trained wildlife men or whether it shall be governed by the whims, fancies, and selfish desires of the deer hunters themselves.

Bibliography

Allen, Durward. 1948. Does Ain't Deer. Sports Afield. Dec. 1948.

Bailey, Vernon. 1928. Deer investigations in Pennsylvania. Mimeo. report to Bureau of Biological Survey, Washington.

Bartlett, I. H. 1938. Whitetails. Game Division, Michigan Dept. of Conservation, Lansing.

Bennett, Logan J. 1942. Don't miss the boat. Pa. Game News. 13 (9): 14,24.

Bramble, W. C. and M. K. Goddard. 1943. Seasonal browsing of woody plants by whitetailed deer in the bear oak forest type. Journ. Forestry. 41 (3): 471-475.

Bramble, W. C. and P. F. English. 1948. The forest grazing problem created by deer in eastern forests. Proc. Soc. of Am. Foresters Meeting, Boston.

Clepper, Henry E. 1931. The deer problem in the forests of Pennsylvania. Bull. 50. Dept. of Forests and Waters, Harrisburg.

English, P. F. and W. C. Bramble. 1949. Kill 'em? — Starve 'em? — Feed 'em? Deer eat best forage they can find. Science for the Farmer. June, 1949. The Pa. State College, State College, Pa.

Foote, Leonard E. 1945. The Vermont deer herd. State Bull., Pittman-Robertson Series 13. Vermont Fish and Game Service, Montpelier.

Forbes, E. B. and S. I. Bechdel. 1931. Mountain laurel and rhododendron as foods for the white tailed deer. Ecology, 12 (2):323-333.

Forbes, E. B. and L. O. Overholts. 1931. Deer carrying capacity of Pennsylvania woodland. Ecology 12 (4):750-752.

Frontz, Leroy. 1930. Deer damage to forest trees in Pennsylvania. Res. Circ. 3. Dept. of Forests and Waters, Harrisburg.

Gerstell, Richard. 1937. Why antlerless deer seasons are necessary. Pa. Game News. 8 (6):

Gerstell, Richard. 1938. The Pennsylvania deer problem in 1938. Part 1. Pa. Game News. 9 (5):

Gerstell, Richard. 1938. The Pennsylvania deer problem in 1938. Part 2. Pa. Game News. 9 (6):

Gordon, Seth. 1942. Pennsylvania bags 700,000 deer in ten years. Outdoor America. Jan. 1942.

Latham, Roger M. 1943. Our deer—past, present, and future. Pa. Game News. 14 (9):4,5,26,27.

Latham, Roger M. 1948. Harvesting our deer crop. Pa. Game News. 19 (2):4,5,17,21.

Leffler, Ross L. 1948. Our deer herd and its effect upon the management of food and cover for wildlife. Paper presented to 38th Convention Int. Assn. of Game, Fish and Conservation Commissioners, Atlantic City.

Leopold, Aldo. 1943. Deer irruptions. Trans. Wisconsin Acad. Sci., Arts and Letters. Vol. 35, pp. 351-366.

Leopold, Aldo, Lyle K. Sawls, and David L. Spencer. 1947. A survey of over-populated deer ranges in the United States. Journ. Wildlife Management. Vol. 11 (2), pp 162-177.

McCain, Randall. 1940. Some effects of heavy deer concentrations on plant growth in the Allegheny National Forest. Pa. Game News. 10 (10): pp. 10,29.

Maynard, L. A. et al. 1935. Food preferences and requirements of the white tailed deer in New York State. New York Conservation Dept. and New York St. College of Agriculture, Albany and Ithaca.

Middour, J. C. and James N. Morton. 1938. Deer damage study plots in Pennsylvania. Pa. Game News. 9 (9): pp. 8,9,30 and 31.

Severinghaus, C. W. 1949. Quarterly Progress Report, Pittman-Robertson Project No. 28-R. January 1, 1949. New York Conservation Dept., Albany.

Severinghaus, C. W. and John E. Tanck. 1947. Information from Quarterly Progress Report, Pittman-Robertson Project No. 28-R. October 1, 1947. N. Y. Conservation Dept., Albany. (By permission)

Severinghaus, C. W. and John E. Tanck. 1949. Information from Quarterly Progress Report, Pittman-Robertson Project No. 28-R. January 1, 1949. N. Y. Conservation Dept., Albany. (By permission)

Stewart, Norman H. 1938. Observations on parasites in the deer of Pennsylvania. The Biologist. 20 (2).

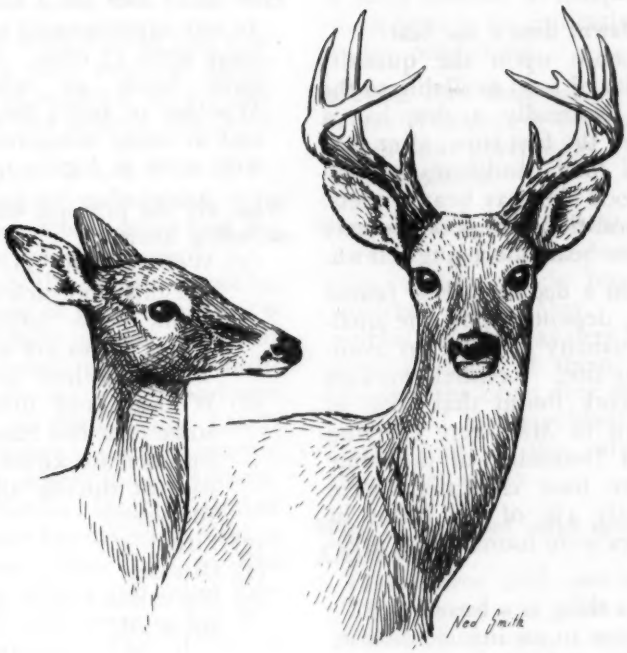
Swift, Ernest. 1946. A history of Wisconsin deer. Pub. 323. Wisconsin Conservation Department, Madison.

Swift, R. W. 1948. Deer select most nutritious forages. Journ. Wild. Mgt. 12 (1): 109-110.

Winecoff, Thos. E. 1930. The Pennsylvania deer problem. Bull. 12. Pa. Game Commission, Harrisburg.

Hough, A. F. 1949. Deer and rabbit browsing and available winter forage in Allegheny hardwood forests. Journ. Wildl. Mgt. 13 (1): 135-141.

DO YOU KNOW?



THE FACTS ABOUT WHITE-TAILED DEER

Compiled By

ROBERT D. MCDOWELL, *Chief, Wildlife Research Division*
PENNSYLVANIA GAME COMMISSION
HARRISBURG, PENNSYLVANIA

September 1950

LIFE HISTORY

When do deer breed?
Normally from October to December.

When are the fawns born?
Normally in May and June. The peak about Memorial Day.

What is the gestation period of the white-tailed deer?
205-212 days.

How many fawns does a doe bear?
This depends upon the quantity and quality of food available to the mother. Normally a doe has a single fawn the first time; after that twins. If food conditions are extremely good she may bear triplets. If food conditions are poor she may continue to bear but a single fawn.

How old must a doe be to bear fawns?
This, too, depends upon the quality and quantity of the food available to the doe. Research workers in New York found that 36% of fawns born in May were carrying a fawn in December of the same year where food conditions were ideal. Only 4% of the fawns in poor ranges were found to be pregnant.

Is there such a thing as a barren doe?
Due, perhaps to an injury, disease, or infertility at birth—yes. Due to old age—no. Does held in captivity have borne fawns, year after year, for 13 years. It is very unlikely that many deer live this long in the wild. Mature does not carrying young simply haven't been bred.

When do fawns lose their spots?
When they are about five months old.

Do deer change the color of their coats?
Yes. They have a short, reddish summer coat and a dark grey heavy winter coat.

Why do we sometimes see spotted fawns during the hunting season?
These fawns were not born until September. When does are not bred during the regular season, they may be bred later and bear fawns in September or December. These late fawns have little chance of surviving the winter.

How old is a buck before he is sexually mature?
Eighteen months.

How many does can a buck serve?
In our experimental pens we had a buck serve 17 does. All these does gave birth to normal fawns. Whether or not a buck could contact as many receptive does in the wild state is highly questionable.

What are the principal enemies of deer, excluding hunters?
(1) Well-meaning but misinformed persons who pick up what they think are "orphan" fawns. These fawns are not neglected. Their mothers are nearby.
(2) Wildcats and foxes may take some deer but many times that number are killed by dogs left to run during all months of the year.
(3) Fires.
(4) Disease.
(5) Starvation—the greatest of them all.

FOOD HABITS

What do deer eat?
Deer eat grasses, ferns, and other green herbaceous plants. This is called grazing. Primarily, however, deer are browsing animals. This means that they eat the tender twigs, buds and leaves of trees. Deer also rely upon acorns and nuts. These foods are called "mast". Deer also, as too many farmers know, will raid vegetable gardens, grain fields, and orchards.

What is good browse?
Browse that will permit the growth of an animal and the maintenance, or nearly so, of the body weight

during the winter. Such browse is provided by the maples, apples, white cedar, viburnums, oaks, aspen, birches (except black birch), ash, hickory, etc., in proper balance.

What are starvation foods?

Laurel, rhododendron, fir, pine, spruce, and other conifers.

How much food does a deer require daily?

To maintain itself during the winter months a deer requires about two pounds of superior browse per day for each 100 pounds live body weight.

If deer are dying of malnutrition, why doesn't the Game Commission feed the deer during the winter months?

Deer, during the winter months, require browse of good quality. To put this browse where they can reach it involves cutting or bulldozing. Both are costly and *are* being done on State Game Lands where the timber is of no economic value except as deer food. Remember, this Nation faces a timber shortage, but Pennsylvania has a deer surplus. Deer like to bed down in the alfalfa and other hays provided by well-meaning but misinformed persons. They don't eat much of it.

AGE, WEIGHT AND ANTLER DEVELOPMENT

How can a hunter know the age of a deer he has shot?

Only by tooth development. This is a highly specialized technique. Anyone interested should read Bill Severinghaus' article in the April 1949 issue of the *Journal of Wildlife Management.*

Can a hunter tell the age of a buck he has shot by its antler development?

No. Antler development is dependent upon the quality and quantity of available food. If food conditions are poor, a male fawn's "buttons" may never break through the skin. The next year this same undernourished animal may have small spikes and have only spikes or a scrubby rack for life. On the other hand, a well-fed male deer will usually never bear spikes. He may have a ten-point rack when 18 months old. The presence of a large number of spike bucks in a deer herd is an indication of poor range conditions.

Do bucks shed their antlers every year?

Yes. When shed, their antlers are eaten by porcupines, mice, and other rodents.

When do bucks shed their antlers?

In our experimental pens we found that well-fed bucks retained their antlers until May. Poorly-fed bucks lost their antlers during the winter, some of them before, or during, the open deer season. The better-fed bucks rubbed their new racks "out of the velvet" before the other bucks.

What is the record antler spread in North America?

Thirty-three and one-half inches. This buck was shot in British Columbia in 1905.

What is the record antler spread in Pennsylvania?

Thirty-two and three-quarter inches. This buck was shot by Al Prouty of Williamsport, on the Susquehanna Ordnance Grounds, where ideal brush conditions prevail, on December 5, 1949.

What governs the weight of a deer?

Age and food conditions.

What is the weight of the heaviest deer shot in Pennsylvania?

There have been heavier deer shot than our *official* record of 207 pounds indicates. Let us know of them.

What is the average weight of our legal bucks?

About 115 pounds, hog-dressed.

Where are the big bucks killed in Pennsylvania?

In the farming sections where there are interspersed woods and where there are not yet too many deer for the available food. Compare a deer from Erie, Mercer, Allegheny, Washington, Lancaster, Chester, Montgomery counties (to mention a few) with one, of equal age, from Potter, Elk, McKean, Cameron, Wayne counties (to mention a few) and see the difference. Big bucks develop where there is ample food.

PENNSYLVANIA'S DEER HERD

How many "kinds" of deer do we have in Pennsylvania?

Originally, two sub-species of white-tailed deer. But these have crossed to such a degree that it is doubtful if a "pure type" deer is now found. In our southern counties we had the Virginia white-tailed deer. The northern white-tailed deer was originally found in some of our northern counties. The main difference between these two sub-species is size, the northern deer being the larger. This factor is relative, however, depending upon available food. If a "pure" northern deer (from southeastern Canada) were the same age and were given the same food it should weigh more than a "pure" Virginia deer (from South Carolina).

How many deer do we have in Pennsylvania?

No one knows. No one has developed a census technique that will apply to a large area. However, our game protectors' observations, plus the annual kill figures, give us a fair estimate—but only an estimate—of between six and seven hundred thousand animals prior to the hunting season.

Actually it is not important to know exactly how many deer we have. The important thing is to know whether we have enough, too many, or too few. When our forests are capable of reproducing themselves; when these same forests are then producing deer browse; when a large percentage of our fawns are bearing young; when we are killing a high percentage of legal bucks that are only 18 months old; when the average weight of our deer is much, much heavier; when our bucks once more bear "trophy" racks; when farmers' crops are not devoured, wholesale, by ravenous deer; when winter starvation is a thing of the past; when all our forest-game species have sufficient food and cover; then—and only then—do we have the "right" amount of deer.

What percentage of the deer herd may be taken each year without reducing the size of the herd for the following year?

If food conditions will support a herd, that is with no starvation losses; if the sex ratio is near balance, that is one buck to two or three does; if hunters crop the deer without regards to sex or age—we should crop 33% to 44% of the pre-season herd each year. These are three big "ifs" but they must be reached, or approximated, if Pennsylvania hunters are to enjoy, and reap, the full benefit of our deer herd. To reap the maximum of the harvestable surplus should be the goal of all hunters and is the objective of the Pennsylvania Game Commission under its deer management program.

How can anyone claim that there are too many deer in any particular section of Pennsylvania when, actually, there are fewer deer there than during previous years?

Too many deer in any section means that the number of animals there exceed the present food supply and are preventing the growth of future food. As our trees mature, the closed canopy of their upper branches prevents the sun from striking the forest floor. This condition, plus a hungry deer herd, eliminates the understory of the forest, thus eliminating reforestation.

In addition, as the trees grow, the browse of their branches is carried upward beyond a deer's reach.

When the deer of a section halt, or greatly hamper, the agricultural efforts of the farmers in that section we may say that there are too many deer present.

Also, when deer, although few in numbers, present a serious hazard to motorists of an urban district we may say that there are too many deer present.

What is a "Michigan" buck?

A male deer from Michigan—and that's all. If he's from a section of that state that has good food and not too many deer he'll look like one of our Crawford, or Erie county bucks. If he's from a poor section (and deer starve to death in Michigan, too) he'll look like any buck from our poor-food areas.

Where did the "Michigan" bucks that Pennsylvania stocked come from?

Some were wild-trapped animals but most of them came from deer parks in New Hampshire, New Jersey, North Carolina, Maine, Ohio, Kentucky, Pennsylvania and Michigan. Only 417 came from Michigan; 524 from Pennsylvania. The Pennsylvania Game Commission bought, and stocked, 1,192 deer from 1906 until 1925.

Were these imported deer marked in any way?

No. Bucks all over the state have slit ears. They get split when the bucks are fighting during the breeding season.

Would the importation of mule deer increase the size of our Pennsylvania deer?

No. Mule deer and white-tailed deer belong to two different species. They won't cross.

What will increase the size of our Pennsylvania deer?

The only way is to adjust the herd to its food supply. This *should* be done by shooting the harvestable supply or it *will* be done by starvation and nobody benefits except the deer that survive.

Does inbreeding produce runt deer?

Absolutely not. If the parents are small, due to inferior food, the fawn, or fawns, will be small. If these same fawns are quickly given good food, and lots of it, they'll grow into large animals. The reverse conditions also hold true.

How can a person tell if a deer has died from malnutrition?

When a deer can no longer obtain enough food to maintain its weight it begins to live off the fat stored in its body. A deer cannot store away large amounts of fat under its skin as many other animals do, so after using up this small amount, it utilizes the fat surrounding its internal organs. If it needs more fat it then utilizes that found in the marrow of its bones. The marrow of a well-fed deer is almost white due to the fat content. As the animal absorbs more and more of the marrow fat the marrow changes in color from white, to yellow, to pink, to cranberry red. If the upper leg bone of a deer found dead in the woods is cracked open and the marrow examined one can quickly tell just how malnourished the animal was. In a weakened condition the animal succumbs quickly to pneumonia or other respiratory diseases.

Do we have any epidemic diseases in our Pennsylvania deer?

Evidently not yet. Although in 1935 and 1936 we had an outbreak of some disease (undiagnosed) in one particular section of the state.

Do deer "yard up" in Pennsylvania?

Not to the same extent that they do in some northern and western states where, during deep snows, the deer will use the same yards, usually a cedar swamp, year after year. When there is snow on the ground, when it is very cold, and when strong winds prevail our deer will move into sheltered stream valleys. These stream valleys in our northern tier woods are grown up to hemlock, laurel, and rhododendron—all starvation foods. If the adverse weather conditions continue, the deer will stay there and die there. The youngest, who cannot reach even the starvation foods die first—the larger animals last.

If the weather breaks, the deer will move out again up the slopes where they may find other foods. Evidently the deer realize that they can't afford the energy necessary to reach the slopes, or realize that even if they do there is not enough nourishment there to counteract the effects of the cold exposure. Deer can't be driven from these bottoms. The same number of deer using good weather range may be crowded into 10% of that range during bad weather. The amount of poor food in the bottoms is quickly consumed if the cold snap continues and the fishermen discover the carcasses in the spring.

Why does Pennsylvania protect the spike buck?

As a safety measure. Looking for a rack, or no rack at all, might restrain some irresponsible person from shooting at anything that moves. In Pennsylvania the movement of the brush is more likely to be caused by a fellow hunter rather than by a deer.

MISCELLANEOUS

How do deer communicate with each other?

By snorts and vocal bleats, by stamping the ground, and by use of the scent glands located on the inside of the rear leg near the hocks. The hair surrounding these glands stands erect when a deer is "talking" to another deer. Other scent glands are located at the hoof.

Can a hunter differentiate between the track of a buck and a doe?

Anyone has a 50-50 chance of guessing correctly. Look over a group of hooves at a taxidermist's and see how many you guessed correctly.

Do only bucks, or do only does snort?

Both snort. Don't ever shoot at a deer, or disregard another deer, upon the advice some "old timer" has given you regarding this matter. His school of thought has a 50-50 chance of being wrong.

Do deer trample snakes to death?

Perhaps a doe, in defense of her young, may. However, every penned deer we held, regardless of age or sex, exhibited the utmost terror of all snakes. A piece of rope, held in the hand and moved to simulate a snake, would prevent a buck from charging when a club wouldn't.

Can a deer distinguish colors?

Evidently they can distinguish between shades of colors but not colors, as such. You're perfectly O. K. in a solid red outfit.

Which of the deer's senses are the keenest?

Hearing. Air movement governs their sense of smell. Deer have very poor vision regarding stationary objects but are quick to catch motion.

LAWS

When are the seasons and bag limits determined?

Usually during the July meeting of the Pennsylvania Game Commission.

Upon what basis is the deer season established?

Upon reports and recommendations received from all the Commission's field employees and from conditions reported by sportsmens' organizations and interested individuals.

How are certain counties closed to the hunting of anterless deer?

The Game Law provides that if the Pennsylvania Game Commission receives, thirty days prior to the opening of a proposed antlerless deer season, a petition signed by enough bonafide residents of a particular county, who held resident hunting licenses the previous year or who reside upon and cultivate lands, to equal 51% of the total number of licenses issued within the county to residents of that county, the county will then be closed to the taking of antlerless deer by anyone during the prevailing season.

Any person signing such a petition who is not a resident of that county, or who is not otherwise legally qualified to sign such a petition, shall, upon summary conviction thereof, be sentenced to pay a fine of ten dollars, plus costs, or five days imprisonment.

In addition, the person circulating the petition must attach an affidavit to the petition certifying that, to the best of his knowledge and belief, all signatures and information are valid.

May a person who signs such a petition in a county hunt in that county if it is not closed, or, if it is closed, hunt in an open county?

Yes.

What weapons are legal for killing deer?

(1) Any gauge shotgun, except an automatic, semi-automatic or auto-loading type, that is loaded with single slug or pumpkin ball. Buckshot, of any size, is illegal.

(2) Any rifle, except an automatic, semi-automatic or auto-loading type, firing a center-fire cartridge with all lead, lead alloy, or expanding bullet.

(3) Any pistol, except an automatic, semi-automatic or auto-loading type, firing a center-fire cartridge larger than 25 calibre, and an expanding bullet.

(4) Any bow and arrow, but not a cross bow.

How many men may hunt deer together without filling out a roster?

Four. Five or more men must complete a roster, in duplicate. One copy must be carried on the person of the captain or leader of the party, the other copy must be posted at the camp headquarters in such manner as to be plainly visible from the outside.

When must a deer be tagged?

Within one hour after it has been killed and before it is moved from where it was killed.

When must a report of a deer killed be completed and forwarded to the Pennsylvania Game Commission?

Within five (5) days following the close of the season.

How may the carcass of a deer be transported?

(1) The carcass of a legal deer may be carried by any person, or any common carrier, within the State, if the carcass has attached thereto a card or marker, bearing in English, the name and address of the owner, his hunting license number and the name of the

county where the deer was killed.

(2) Parts of a big-game animal may be transported if *each* parcel or container bears the information, as above, plus a description of the contents.

(3) No game may be shipped parcel post except to a taxidermist. Here again the package should be marked as in (2) above. Shipment to a taxidermist outside Pennsylvania shall be legal only after a permit is obtained from the Executive Director of the Pennsylvania Game Commission.

Can a deer killed in Pennsylvania by a resident hunter be transported or shipped outside the State?

No, except to a taxidermist, after a permit is secured, or if it must be carried out of the state to reach its destination within the state.

Can a hunter sell a deer he has legally killed?

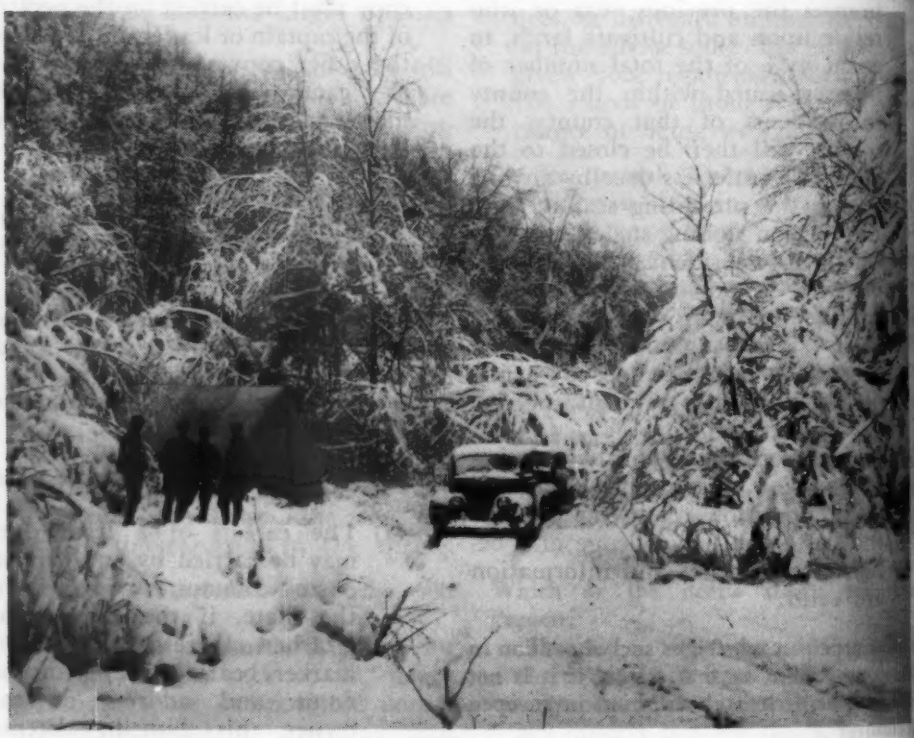
No, except the hide, or parts thereof, which must be sold within 90 days after the close of the season.

May a hunter "sight in" his rifle during the deer season?

Only at a properly constructed target protected by a natural or artificial barrier so that the bullet cannot travel more than 15 yards behind the target and only if such target is erected within 200 yards of the hunter's camp or other headquarters. A hunter may also "sight in" his rifle at a regularly established range.

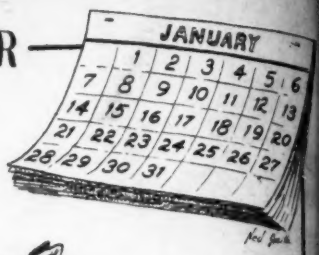
May a hunter enter a State Game Refuge to bring out a deer he shot outside but which died within the wire?

No, unless accompanied by a Game Protector.



A deer camp snow scene in Pennsylvania.

THROUGH THE CALENDAR
with the
WHITETAIL FAMILY



JANUARY FINDS THE DEER HERDS YARDED UP FOR THE MOST CRITICAL TIME OF THE YEAR. HOW MANY WILL SURVIVE DEPENDS UPON THE AVAILABLE SUPPLY OF BROWSE & MAST.

MAY IS THE MONTH IN WHICH MOST FAWNS ARE BORN. BEDDED DOWN ON THE FOREST FLOOR THEY ARE WELL PROTECTED BY THEIR SPOTTED COATS.

JULY· THE BUCKS' ANTLERS ARE GROWING RAPIDLY, AND ARE SOFT AND THICK UNDER THEIR "VELVET" COVERING.

SEPTEMBER· THE FAWNS' SPOTS HAVE GRADUALLY FADED AWAY, MAKING THE YOUNGSTERS MINATURE REPLICAS OF THEIR MOTHERS.

OCTOBER FINDS THE BUCKS RUBBING THE VELVET OFF THEIR FULLY DEVELOPED ANTLERS.

NOVEMBER· THE BUCKS, WITH POLISHED ANTLERS AND SWOLLEN NECKS, ARE SEEKING MATES AND FIGHTING RIVALS WITH EQUAL ARDOR.

JANUARY· THE BUCKS HAVE SHED THEIR ANTLERS AND THE SNOW LIES DEEP AS THE NEW YEAR USHERS IN ANOTHER SEASON OF COLD & HUNGER.